

# SEQUENCE LISTING

|    |  |    |
|----|--|----|
|    | <110> Lyamichev, Victor                                    |    |
|    | <120> CHARGE TAGS AND SEPARATION OF NUCLEIC ACID MOLECULES |    |
| 5  | <130> FORS 4912  |    |
|    | <160> 85   |    |
|    | <170> PatentIn version 3.0                                 |    |
|    | <210> 1  |    |
| 10 | <211> 23   |    |
|    | <212> DNA  |    |
| 15 | <213> synthetic  |    |
|    | <220>  |    |
|    | <221> misc_feature   |    |
| 20 | <222> (1)..(2)   |    |
|    | <223> misc. feature  |    |
|    | <400> 1  |    |
| 25 | tntctttttca ccagcgagac ggg                                 | 23 |
|    | <210> 2  |    |
|    | <211> 22   |    |
| 30 | <212> DNA  |    |
|    | <213> synthetic  |    |
|    | <400> 2  |    |
| 35 | attgggcgcc aggggtggtt tt                                   | 22 |
|    | <210> 3  |    |
|    | <211> 30   |    |
|    | <212> DNA  |    |
| 40 | <213> synthetic  |    |
|    | <400> 3  |    |
|    | caggggtgaag ggaagaagaa agcgaaaggt                          | 30 |
| 45 | <210> 4  |    |
|    | <211> 30   |    |
|    | <212> DNA  |    |
|    | <213> synthetic  |    |
| 50 | <400> 4  |    |
|    | cagggggaag ggaagaagaa agcgaaaggt                           | 30 |
| 55 | <210> 5  |    |
|    | <211> 28   |    |
|    | <212> DNA  |    |
| 60 | <213> synthetic  |    |

<400> 5  
 cacgaattcc gaggcgatgc ttccgctc 28  
 5  
 <210> 6  
 <211> 30  
 10 <212> DNA  
 <213> synthetic  
 <400> 6  
 15 tcgacgtcga ctaacccttg gcggaaagcc 30  
 <210> 7  
 20 <211> 23  
 <212> DNA  
 25 <213> synthetic  
 <400> 7  
 30 gcatcgcctc ggaattcatg gtc 23  
 <210> 8  
 <211> 836  
 35 <212> PRT  
 <213> Thermus thermophilus  
 40 <400> 8  
 Met Asn Ser Glu Ala Met Leu Pro Leu Phe Glu Pro Lys Gly Arg Val  
 1 5 10 15  
 45 Leu Leu Val Asp Gly His His Leu Ala Tyr Arg Thr Phe Phe Ala Leu  
 20 25 30  
 Lys Gly Leu Thr Thr Ser Arg Gly Glu Pro Val Gln Ala Val Tyr Gly  
 35 40 45  
 50 Phe Ala Lys Ser Leu Leu Lys Ala Leu Lys Glu Asp Gly Tyr Lys Ala  
 50 55 60  
 Val Phe Val Val Phe Asp Ala Lys Ala Pro Ser Phe Arg His Glu Ala  
 65 70 75 80  
 55 Tyr Glu Ala Tyr Lys Ala Gly Arg Ala Pro Thr Pro Glu Asp Phe Pro  
 85 90 95  
 60 Arg Gln Leu Ala Leu Ile Lys Glu Leu Val Asp Leu Leu Gly Phe Thr  
 100 105 110

|    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
|    | Arg | Leu | Glu | Val | Pro | Gly | Tyr | Glu | Ala | Asp | Asp | Val | Leu | Ala | Thr | Leu |  |
|    |     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |  |
| 5  | Ala | Lys | Lys | Ala | Glu | Lys | Glu | Gly | Tyr | Glu | Val | Arg | Ile | Leu | Thr | Ala |  |
|    |     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |  |
|    | Asp | Arg | Asp | Leu | Tyr | Gln | Leu | Val | Ser | Asp | Arg | Val | Ala | Val | Leu | His |  |
|    | 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     | 160 |     |  |
| 10 | Pro | Glu | Gly | His | Leu | Ile | Thr | Pro | Glu | Trp | Leu | Trp | Glu | Lys | Tyr | Gly |  |
|    |     |     |     | 165 |     |     |     |     |     | 170 |     |     |     |     | 175 |     |  |
|    | Leu | Arg | Pro | Glu | Gln | Trp | Val | Asp | Phe | Arg | Ala | Leu | Val | Gly | Asp | Pro |  |
|    |     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |  |
| 15 | Ser | Asp | Asn | Leu | Pro | Gly | Val | Lys | Gly | Ile | Gly | Glu | Lys | Thr | Ala | Leu |  |
|    |     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |  |
|    | Lys | Leu | Leu | Lys | Glu | Trp | Gly | Ser | Leu | Glu | Asn | Leu | Leu | Lys | Asn | Leu |  |
| 20 |     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |  |
|    | Asp | Arg | Val | Lys | Pro | Glu | Asn | Val | Arg | Glu | Lys | Ile | Lys | Ala | His | Leu |  |
|    | 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |  |
| 25 | Glu | Asp | Leu | Arg | Leu | Ser | Leu | Glu | Leu | Ser | Arg | Val | Arg | Thr | Asp | Leu |  |
|    |     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |  |
|    | Pro | Leu | Glu | Val | Asp | Leu | Ala | Gln | Gly | Arg | Glu | Pro | Asp | Arg | Glu | Gly |  |
|    |     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |  |
| 30 | Leu | Arg | Ala | Phe | Leu | Glu | Arg | Leu | Glu | Phe | Gly | Ser | Leu | Leu | His | Glu |  |
|    |     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |  |
|    | Phe | Gly | Leu | Leu | Glu | Ala | Pro | Ala | Pro | Leu | Glu | Glu | Ala | Pro | Trp | Pro |  |
| 35 |     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |  |
|    | Pro | Pro | Glu | Gly | Ala | Phe | Val | Gly | Phe | Val | Leu | Ser | Arg | Pro | Glu | Pro |  |
|    | 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |  |
| 40 | Met | Trp | Ala | Glu | Leu | Lys | Ala | Leu | Ala | Ala | Cys | Arg | Asp | Gly | Arg | Val |  |
|    |     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |  |
|    | His | Arg | Ala | Ala | Asp | Pro | Leu | Ala | Gly | Leu | Lys | Asp | Leu | Lys | Glu | Val |  |
|    |     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |  |
| 45 | Arg | Gly | Leu | Leu | Ala | Lys | Asp | Leu | Ala | Val | Leu | Ala | Ser | Arg | Glu | Gly |  |
|    |     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |  |
|    | Leu | Asp | Leu | Val | Pro | Gly | Asp | Asp | Pro | Met | Leu | Leu | Ala | Tyr | Leu | Leu |  |
| 50 |     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |  |
|    | Asp | Pro | Ser | Asn | Thr | Thr | Pro | Glu | Gly | Val | Ala | Arg | Arg | Tyr | Gly | Gly |  |
|    | 385 |     |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |  |
| 55 | Glu | Trp | Thr | Glu | Asp | Ala | Ala | His | Arg | Ala | Leu | Leu | Ser | Glu | Arg | Leu |  |
|    |     |     |     |     | 405 |     |     |     |     | 410 |     |     |     |     | 415 |     |  |
|    | His | Arg | Asn | Leu | Leu | Lys | Arg | Leu | Glu | Gly | Glu | Glu | Lys | Leu | Leu | Trp |  |
|    |     |     |     | 420 |     |     |     |     | 425 |     |     |     |     | 430 |     |     |  |
| 60 | Leu | Tyr | His | Glu | Val | Glu | Lys | Pro | Leu | Ser | Arg | Val | Leu | Ala | His | Met |  |
|    |     |     | 435 |     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |  |

|    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
|    | Glu | Ala | Thr | Gly | Val | Arg | Arg | Asp | Val | Ala | Tyr | Leu | Gln | Ala | Leu | Ser |  |
|    | 450 |     |     |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |  |
| 5  | Leu | Glu | Leu | Ala | Glu | Glu | Ile | Arg | Arg | Leu | Glu | Glu | Glu | Val | Phe | Arg |  |
|    | 465 |     |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |  |
|    | Leu | Ala | Gly | His | Pro | Phe | Asn | Leu | Asn | Ser | Arg | Asp | Gln | Leu | Glu | Arg |  |
|    |     |     |     |     | 485 |     |     |     |     | 490 |     |     |     |     | 495 |     |  |
| 10 | Val | Leu | Phe | Asp | Glu | Leu | Arg | Leu | Pro | Ala | Leu | Gly | Lys | Thr | Gln | Lys |  |
|    |     |     |     | 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |  |
|    | Thr | Gly | Lys | Arg | Ser | Thr | Ser | Ala | Ala | Val | Leu | Glu | Ala | Leu | Arg | Glu |  |
|    |     |     | 515 |     |     |     |     | 520 |     |     |     |     | 525 |     |     |     |  |
| 15 | Ala | His | Pro | Ile | Val | Glu | Lys | Ile | Leu | Gln | His | Arg | Glu | Leu | Thr | Lys |  |
|    | 530 |     |     |     |     |     | 535 |     |     |     |     | 540 |     |     |     |     |  |
| 20 | Leu | Lys | Asn | Thr | Tyr | Val | Asp | Pro | Leu | Pro | Ser | Leu | Val | His | Pro | Arg |  |
|    | 545 |     |     |     |     | 550 |     |     |     |     | 555 |     |     |     |     | 560 |  |
|    | Thr | Gly | Arg | Leu | His | Thr | Arg | Phe | Asn | Gln | Thr | Ala | Thr | Ala | Thr | Gly |  |
|    |     |     |     |     | 565 |     |     |     |     | 570 |     |     |     |     |     | 575 |  |
| 25 | Arg | Leu | Ser | Ser | Ser | Asp | Pro | Asn | Leu | Gln | Asn | Ile | Pro | Val | Arg | Thr |  |
|    |     |     |     | 580 |     |     |     |     | 585 |     |     |     |     | 590 |     |     |  |
|    | Pro | Leu | Gly | Gln | Arg | Ile | Arg | Arg | Ala | Phe | Val | Ala | Glu | Ala | Gly | Trp |  |
|    |     |     | 595 |     |     |     |     | 600 |     |     |     |     | 605 |     |     |     |  |
| 30 | Ala | Leu | Val | Ala | Leu | Asp | Tyr | Ser | Gln | Ile | Glu | Leu | Arg | Val | Leu | Ala |  |
|    |     | 610 |     |     |     |     | 615 |     |     |     |     | 620 |     |     |     |     |  |
|    | His | Leu | Ser | Gly | Asp | Glu | Asn | Leu | Ile | Arg | Val | Phe | Gln | Glu | Gly | Lys |  |
| 35 | 625 |     |     |     |     | 630 |     |     |     |     | 635 |     |     |     |     | 640 |  |
|    | Asp | Ile | His | Thr | Gln | Thr | Ala | Ser | Trp | Met | Phe | Gly | Val | Pro | Pro | Glu |  |
|    |     |     |     |     | 645 |     |     |     |     | 650 |     |     |     |     | 655 |     |  |
| 40 | Ala | Val | Asp | Pro | Leu | Met | Arg | Arg | Ala | Ala | Lys | Thr | Val | Asn | Phe | Gly |  |
|    |     |     |     | 660 |     |     |     |     | 665 |     |     |     |     | 670 |     |     |  |
|    | Val | Leu | Tyr | Gly | Met | Ser | Ala | His | Arg | Leu | Ser | Gln | Glu | Leu | Ala | Ile |  |
|    |     |     | 675 |     |     |     |     | 680 |     |     |     |     | 685 |     |     |     |  |
| 45 | Pro | Tyr | Glu | Glu | Ala | Val | Ala | Phe | Ile | Glu | Arg | Tyr | Phe | Gln | Ser | Phe |  |
|    |     | 690 |     |     |     |     | 695 |     |     |     |     | 700 |     |     |     |     |  |
| 50 | Pro | Lys | Val | Arg | Ala | Trp | Ile | Glu | Lys | Thr | Leu | Glu | Glu | Gly | Arg | Lys |  |
|    | 705 |     |     |     |     | 710 |     |     |     |     | 715 |     |     |     |     | 720 |  |
|    | Arg | Gly | Tyr | Val | Glu | Thr | Leu | Phe | Gly | Arg | Arg | Arg | Tyr | Val | Pro | Asp |  |
|    |     |     |     |     | 725 |     |     |     |     | 730 |     |     |     |     | 735 |     |  |
| 55 | Leu | Asn | Ala | Arg | Val | Lys | Ser | Val | Arg | Glu | Ala | Ala | Glu | Arg | Met | Ala |  |
|    |     |     |     | 740 |     |     |     |     | 745 |     |     |     |     | 750 |     |     |  |
|    | Phe | Asn | Met | Pro | Val | Gln | Gly | Thr | Ala | Ala | Asp | Leu | Met | Lys | Leu | Ala |  |
|    |     |     | 755 |     |     |     |     | 760 |     |     |     |     | 765 |     |     |     |  |
| 60 | Met | Val | Lys | Leu | Phe | Pro | Arg | Leu | Arg | Glu | Met | Gly | Ala | Arg | Met | Leu |  |
|    |     | 770 |     |     |     |     | 775 |     |     |     |     | 780 |     |     |     |     |  |

Leu Gln Val His Asp Glu Leu Leu Leu Glu Ala Pro Gln Ala Arg Ala  
 785 790 795 800  
 5 Glu Glu Val Ala Ala Leu Ala Lys Glu Ala Met Glu Lys Ala Tyr Pro  
 805 810 815  
 Leu Ala Val Pro Leu Glu Val Glu Val Gly Met Gly Glu Asp Trp Leu  
 820 825 830  
 10 Ser Ala Lys Gly  
 835  
 <210> 9  
 15 <211> 2511  
 <212> DNA  
 20 <213> *Thermus thermophilus*  
 <400> 9  
 atgaattccg aggcgatgct tccgctcttt gaacccaaag gccgggtcct cctggtggac 60  
 25 ggccaccacc tggcctaccg caccttcttc gccctgaagg gcctcaccac gagccggggc 120  
 gaaccggtgc aggcggtcta cggcttcgcc aagagcctcc tcaaggccct gaaggaggac 180  
 30 ggggtacaagg ccgtcttcgt ggtctttgac gccaaggccc cctccttcgc ccacgaggcc 240  
 tacgaggcct acaaggcggg gagggccccg accccgagg acttccccgc gcagctcgcc 300  
 ctcacatcaagg agctggtgga cctcctgggg tttaccgcgc tcgagggtccc cggctacgag 360  
 35 gcgagcgacg ttctcgccac cctggccaag aaggcggaag aggaggggta cgaggtgcgc 420  
 atcctcaccg ccgaccgcga cctctaccaa ctcgctctcc accgcgtcgc cgtcctccac 480  
 40 cccgagggcc acctcatcac cccggagtgg ctttgggaga agtacggcct caggccggag 540  
 cagtgggtgg acttccgcgc cctcgtgggg gaccctccg acaacctccc cggggtcaag 600  
 ggcatcgggg agaagaccgc cctcaagctc ctcaaggagt ggggaagcct ggaaaacctc 660  
 45 ctcaagaacc tggaccgggt aaagccagaa aacgtccggg agaagatcaa ggcccacctg 720  
 gaagacctca ggctctcctt ggagctctcc cgggtgcgca ccgacctccc cctggagggtg 780  
 50 gacctcgccc aggggcggga gcccgaccgg gaggggctta gggccttcct ggagagggtg 840  
 gagttcggca gcctcctcca cgagttcggc ctcttgagg ccccgcccc cctggaggag 900  
 gccccctggc ccccgccgga aggggccttc gtgggcttcg tctctcccc ccccgagccc 960  
 55 atgtgggctg agcttaaagc cctggccgcc tgcagggacg gccgggtgca ccgggcagca 1020  
 gacctcttgg cggggctaaa ggacctcaag gaggtccggg gcctcctcgc caaggacctc 1080  
 60 gccgtcttgg cctcgaggga ggggctagac ctctgtccc gggacgacct catgctctc 1140  
 gcctacctcc tggacctctc caacaccacc cccgaggggg tggcgcgccg ctacgggggg 1200

|    |  |      |
|----|--|------|
|    | gagtggacgg aggacgccgc ccaccggggcc ctctctctcg agaggctcca tcggaacctc | 1260 |
|    | cttaagcgcc tcgaggggga ggagaagctc ctttggctct accacgaggt ggaaaagccc  | 1320 |
| 5  | ctctcccggg tcctggccca catggaggcc accgggggtac ggcgggacgt ggcctacctt | 1380 |
|    | caggcccttt ccctggagct tgcggaggag atccgccgcc tcgaggagga ggtcttccgc  | 1440 |
| 10 | ttggcggggc accccttcaa cctcaactcc cgggaccagc tggaaagggg gctctttgac  | 1500 |
|    | gagcttaggc ttcccgccctt ggggaagacg caaaagacag gcaagcgctc caccagcgcc | 1560 |
|    | gcggtgctgg aggccctacg ggaggccccc cccatcgtgg agaagatcct ccagcaccgg  | 1620 |
| 15 | gagctcacca agctcaagaa cacctacgtg gacccccctc caagcctcgt ccacccgagg  | 1680 |
|    | acggggccgcc tccacacccg cttcaaccag acggccacgg ccacggggag gcttagtagc | 1740 |
| 20 | tccgaccca acctgcagaa catccccgtc cgcaccccct tgggccagag gatccgccgg   | 1800 |
|    | gccttcgtgg ccgaggcggg ttgggcgttg gtggcccttg actatagcca gatagagctc  | 1860 |
|    | cgcgtcctcg cccacctctc cggggacgaa aacctgatca gggctttcca ggaggggaag  | 1920 |
| 25 | gacatccaca cccagaccgc aagctggatg ttccggcgtc ccccgaggc cgtggacccc   | 1980 |
|    | ctgatgcgcc gggcggccaa gacggtgaac ttccggcgtc tctacggcat gtccgcccac  | 2040 |
| 30 | aggctctccc aggagcttgc catccccctac gaggaggcgg tggcctttat agagcgctac | 2100 |
|    | ttccaaagct tccccaaagt gcgggccttg atagaaaaga ccctggagga ggggaggaag  | 2160 |
|    | cggggctacg tggaaacctt cttcggaaga aggcgctacg tgcccacct caacgcccg    | 2220 |
| 35 | gtgaagagcg tcaggaggc cgcggagcgc atggccttca acatgcccg ccagggcacc    | 2280 |
|    | gccgccgacc tcatgaagct cgccatggtg aagctcttcc cccgcctccg ggagatgggg  | 2340 |
| 40 | gcccgcagtc tcctccaggt ccacgacgag ctctccttg agggccccca agcgcggggc   | 2400 |
|    | gaggaggtgg cggctttggc caaggaggcc atggagaagg cctatcccct cgccgtgccc  | 2460 |
|    | ctggaggtgg aggtggggat gggggaggac tggctttccg ccaagggtta g           | 2511 |
| 45 | <210> 10   |      |
|    | <211> 26   |      |
| 50 | <212> DNA  |      |
|    | <213> synthetic  |      |
|    | <400> 10   |      |
| 55 | caggaggagc tcgttggtgga cctgga                                      | 26   |
|    | <210> 11   |      |
| 60 | <211> 836  |      |

<212> PRT

<213> Thermus thermophilus

5 <400> 11

|    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
|    | Met | Asn | Ser | Glu | Ala | Met | Leu | Pro | Leu | Phe | Glu | Pro | Lys | Gly | Arg | Val |  |
|    | 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |  |
| 10 | Leu | Leu | Val | Asp | Gly | His | His | Leu | Ala | Tyr | Arg | Thr | Phe | Phe | Ala | Leu |  |
|    |     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |  |
|    | Lys | Gly | Leu | Thr | Thr | Ser | Arg | Gly | Glu | Pro | Val | Gln | Ala | Val | Tyr | Gly |  |
|    |     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |  |
| 15 | Phe | Ala | Lys | Ser | Leu | Leu | Lys | Ala | Leu | Lys | Glu | Asp | Gly | Tyr | Lys | Ala |  |
|    |     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |  |
|    | Val | Phe | Val | Val | Phe | Asp | Ala | Lys | Ala | Pro | Ser | Phe | Arg | His | Glu | Ala |  |
| 20 |     | 65  |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |  |
|    | Tyr | Glu | Ala | Tyr | Lys | Ala | Gly | Arg | Ala | Pro | Thr | Pro | Glu | Asp | Phe | Pro |  |
|    |     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |  |
|    | Arg | Gln | Leu | Ala | Leu | Ile | Lys | Glu | Leu | Val | Asp | Leu | Leu | Gly | Phe | Thr |  |
| 25 |     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |  |
|    | Arg | Leu | Glu | Val | Pro | Gly | Tyr | Glu | Ala | Asp | Asp | Val | Leu | Ala | Thr | Leu |  |
|    |     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |  |
| 30 | Ala | Lys | Lys | Ala | Glu | Lys | Glu | Gly | Tyr | Glu | Val | Arg | Ile | Leu | Thr | Ala |  |
|    |     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |  |
|    | Asp | Arg | Asp | Leu | Tyr | Gln | Leu | Val | Ser | Asp | Arg | Val | Ala | Val | Leu | His |  |
| 35 |     | 145 |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |  |
|    | Pro | Glu | Gly | His | Leu | Ile | Thr | Pro | Glu | Trp | Leu | Trp | Glu | Lys | Tyr | Gly |  |
|    |     |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |  |
|    | Leu | Arg | Pro | Glu | Gln | Trp | Val | Asp | Phe | Arg | Ala | Leu | Val | Gly | Asp | Pro |  |
| 40 |     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |  |
|    | Ser | Asp | Asn | Leu | Pro | Gly | Val | Lys | Gly | Ile | Gly | Glu | Lys | Thr | Ala | Leu |  |
|    |     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |  |
| 45 | Lys | Leu | Leu | Lys | Glu | Trp | Gly | Ser | Leu | Glu | Asn | Leu | Leu | Lys | Asn | Leu |  |
|    |     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |  |
|    | Asp | Arg | Val | Lys | Pro | Glu | Asn | Val | Arg | Glu | Lys | Ile | Lys | Ala | His | Leu |  |
| 50 |     | 225 |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |  |
|    | Glu | Asp | Leu | Arg | Leu | Ser | Leu | Glu | Leu | Ser | Arg | Val | Arg | Thr | Asp | Leu |  |
|    |     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |  |
|    | Pro | Leu | Glu | Val | Asp | Leu | Ala | Gln | Gly | Arg | Glu | Pro | Asp | Arg | Glu | Gly |  |
| 55 |     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |  |
|    | Leu | Arg | Ala | Phe | Leu | Glu | Arg | Leu | Glu | Phe | Gly | Ser | Leu | Leu | His | Glu |  |
|    |     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |  |
| 60 | Phe | Gly | Leu | Leu | Glu | Ala | Pro | Ala | Pro | Leu | Glu | Glu | Ala | Pro | Trp | Pro |  |
|    |     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |  |

|    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
|    | Pro | Pro | Glu | Gly | Ala | Phe | Val | Gly | Phe | Val | Leu | Ser | Arg | Pro | Glu | Pro |  |
|    | 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |  |
| 5  | Met | Trp | Ala | Glu | Leu | Lys | Ala | Leu | Ala | Ala | Cys | Arg | Asp | Gly | Arg | Val |  |
|    |     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |  |
|    | His | Arg | Ala | Ala | Asp | Pro | Leu | Ala | Gly | Leu | Lys | Asp | Leu | Lys | Glu | Val |  |
|    |     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |  |
| 10 | Arg | Gly | Leu | Leu | Ala | Lys | Asp | Leu | Ala | Val | Leu | Ala | Ser | Arg | Glu | Gly |  |
|    |     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |  |
|    | Leu | Asp | Leu | Val | Pro | Gly | Asp | Asp | Pro | Met | Leu | Leu | Ala | Tyr | Leu | Leu |  |
|    |     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |  |
| 15 | Asp | Pro | Ser | Asn | Thr | Thr | Pro | Glu | Gly | Val | Ala | Arg | Arg | Tyr | Gly | Gly |  |
|    | 385 |     |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |  |
|    | Glu | Trp | Thr | Glu | Asp | Ala | Ala | His | Arg | Ala | Leu | Leu | Ser | Glu | Arg | Leu |  |
|    |     |     |     |     | 405 |     |     |     |     | 410 |     |     |     |     | 415 |     |  |
| 20 | His | Arg | Asn | Leu | Leu | Lys | Arg | Leu | Glu | Gly | Glu | Glu | Lys | Leu | Leu | Trp |  |
|    |     |     | 420 |     |     |     |     |     | 425 |     |     |     |     | 430 |     |     |  |
| 25 | Leu | Tyr | His | Glu | Val | Glu | Lys | Pro | Leu | Ser | Arg | Val | Leu | Ala | His | Met |  |
|    |     |     | 435 |     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |  |
|    | Glu | Ala | Thr | Gly | Val | Arg | Arg | Asp | Val | Ala | Tyr | Leu | Gln | Ala | Leu | Ser |  |
|    |     | 450 |     |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |  |
| 30 | Leu | Glu | Leu | Ala | Glu | Glu | Ile | Arg | Arg | Leu | Glu | Glu | Glu | Val | Phe | Arg |  |
|    |     | 465 |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |  |
|    | Leu | Ala | Gly | His | Pro | Phe | Asn | Leu | Asn | Ser | Arg | Asp | Gln | Leu | Glu | Arg |  |
|    |     |     |     |     | 485 |     |     |     | 490 |     |     |     |     |     | 495 |     |  |
| 35 | Val | Leu | Phe | Asp | Glu | Leu | Arg | Leu | Pro | Ala | Leu | Gly | Lys | Thr | Gln | Lys |  |
|    |     |     |     | 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |  |
| 40 | Thr | Gly | Lys | Arg | Ser | Thr | Ser | Ala | Ala | Val | Leu | Glu | Ala | Leu | Arg | Glu |  |
|    |     |     | 515 |     |     |     |     | 520 |     |     |     |     | 525 |     |     |     |  |
|    | Ala | His | Pro | Ile | Val | Glu | Lys | Ile | Leu | Gln | His | Arg | Glu | Leu | Thr | Lys |  |
|    |     | 530 |     |     |     |     | 535 |     |     |     |     | 540 |     |     |     |     |  |
| 45 | Leu | Lys | Asn | Thr | Tyr | Val | Asp | Pro | Leu | Pro | Ser | Leu | Val | His | Pro | Arg |  |
|    |     | 545 |     |     |     | 550 |     |     |     |     | 555 |     |     |     |     | 560 |  |
|    | Thr | Gly | Arg | Leu | His | Thr | Arg | Phe | Asn | Gln | Thr | Ala | Thr | Ala | Thr | Gly |  |
|    |     |     |     |     | 565 |     |     |     |     | 570 |     |     |     |     | 575 |     |  |
| 50 | Arg | Leu | Ser | Ser | Ser | Asp | Pro | Asn | Leu | Gln | Asn | Ile | Pro | Val | Arg | Thr |  |
|    |     |     |     | 580 |     |     |     |     | 585 |     |     |     |     | 590 |     |     |  |
| 55 | Pro | Leu | Gly | Gln | Arg | Ile | Arg | Arg | Ala | Phe | Val | Ala | Glu | Ala | Gly | Trp |  |
|    |     |     | 595 |     |     |     |     | 600 |     |     |     |     | 605 |     |     |     |  |
|    | Ala | Leu | Val | Ala | Leu | Asp | Tyr | Ser | Gln | Ile | Glu | Leu | Arg | Val | Leu | Ala |  |
|    |     | 610 |     |     |     |     | 615 |     |     |     |     | 620 |     |     |     |     |  |
| 60 | His | Leu | Ser | Gly | Asp | Glu | Asn | Leu | Ile | Arg | Val | Phe | Gln | Glu | Gly | Lys |  |
|    |     | 625 |     |     |     | 630 |     |     |     |     | 635 |     |     |     |     | 640 |  |



|    |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
|    | Asp  | Ile | His | Thr | Gln | Thr | Ala | Ser | Trp | Met | Phe | Gly | Val | Pro | Pro | Glu |  |
|    |  |     |     |     | 645 |     |     |     |     | 650 |     |     |     |     | 655 |     |  |
| 5  | Ala  | Val | Asp | Pro | Leu | Met | Arg | Arg | Ala | Ala | Lys | Thr | Val | Asn | Phe | Gly |  |
|    |  |     |     | 660 |     |     |     |     | 665 |     |     |     |     | 670 |     |     |  |
|    | Val  | Leu | Tyr | Gly | Met | Ser | Ala | His | Arg | Leu | Ser | Gln | Glu | Leu | Ala | Ile |  |
|    |  |     | 675 |     |     |     |     | 680 |     |     |     |     | 685 |     |     |     |  |
| 10 | Pro  | Tyr | Glu | Glu | Ala | Val | Ala | Phe | Ile | Glu | Arg | Tyr | Phe | Gln | Ser | Phe |  |
|    |  | 690 |     |     |     |     | 695 |     |     |     |     | 700 |     |     |     |     |  |
|    | Pro  | Lys | Val | Arg | Ala | Trp | Ile | Glu | Lys | Thr | Leu | Glu | Glu | Gly | Arg | Lys |  |
|    | 705  |     |     |     |     | 710 |     |     |     |     | 715 |     |     |     | 720 |     |  |
| 15 | Arg  | Gly | Tyr | Val | Glu | Thr | Leu | Phe | Gly | Arg | Arg | Arg | Tyr | Val | Pro | Asp |  |
|    |  |     |     |     | 725 |     |     |     |     | 730 |     |     |     |     | 735 |     |  |
|    | Leu  | Asn | Ala | Arg | Val | Lys | Ser | Val | Arg | Glu | Ala | Ala | Glu | Arg | Met | Ala |  |
| 20 |  |     |     | 740 |     |     |     |     | 745 |     |     |     |     | 750 |     |     |  |
|    | Phe  | Asn | Met | Pro | Val | Gln | Gly | Thr | Ala | Ala | Asp | Leu | Met | Lys | Leu | Ala |  |
|    |  |     | 755 |     |     |     |     | 760 |     |     |     |     | 765 |     |     |     |  |
| 25 | Met  | Val | Lys | Leu | Phe | Pro | Arg | Leu | Arg | Glu | Met | Gly | Ala | Arg | Met | Leu |  |
|    |  | 770 |     |     |     |     | 775 |     |     |     |     | 780 |     |     |     |     |  |
|    | Leu  | Gln | Val | His | Asn | Glu | Leu | Leu | Leu | Glu | Ala | Pro | Gln | Ala | Arg | Ala |  |
|    | 785  |     |     |     |     | 790 |     |     |     |     | 795 |     |     |     |     | 800 |  |
| 30 | Glu  | Glu | Val | Ala | Ala | Leu | Ala | Lys | Glu | Ala | Met | Glu | Lys | Ala | Tyr | Pro |  |
|    |  |     |     |     | 805 |     |     |     |     | 810 |     |     |     |     | 815 |     |  |
|    | Leu  | Ala | Val | Pro | Leu | Glu | Val | Glu | Val | Gly | Met | Gly | Glu | Asp | Trp | Leu |  |
| 35 |  |     |     | 820 |     |     |     |     | 825 |     |     |     |     | 830 |     |     |  |
|    | Ser  | Ala | Lys | Gly |     |     |     |     |     |     |     |     |     |     |     |     |  |
|    |  |     | 835 |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 40 | <210> 12   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|    | <211> 2511   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 45 | <212> DNA  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|    | <213> Thermus thermophilus   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|    | <400> 12   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 50 | atgaattccg aggcgatgct tccgctcttt gaacccaaag gccgggtcct cctggtggac 60   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|    | ggccaccacc tggcctaccg caccttcttc gccctgaagg gcctcaccac gagccggggc 120  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 55 | gaaccggtgc aggcggtcta cggcttcgcc aagagcctcc tcaaggccct gaaggaggac 180  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|    | gggtacaagg ccgtcttcgt ggtctttgac gccaaaggccc cctccttcgc ccacgaggcc 240 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|    | tacgaggcct acaaggcggg gagggccccc acccccagag acttcccccg gcagctcgcc 300  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 60 | ctcatcaagg agctggtgga cctcctgggg ttaccgcgc tcgaggtccc cggctacgag 360   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |

|    |  |      |
|----|--|------|
|    | gcggacgacg ttctcgccac cctggccaag aaggcggaag aggaggggta cgaggtgcgc  | 420  |
|    | atcctcaccg ccgaccgga cctctaccaa ctctgtctccg accgcgtcgc cgtcctccac  | 480  |
| 5  | cccgagggcc acctcatcac cccggagtgg ctttgggaga agtacggcct caggccggag  | 540  |
|    | cagtgggtgg acttccgcgc cctcgtgggg gacccctccg acaacctccc cggggtcaag  | 600  |
| 10 | ggcatcgggg agaagaccgc cctcaagctc ctcaaggagt ggggaagcct ggaaaacctc  | 660  |
|    | ctcaagaacc tggaccgggt aaagccagaa aacgtccggg agaagatcaa ggcccacctg  | 720  |
|    | gaagacctca ggctctcctt ggagctctcc cgggtgcgca ccgacctccc cctggaggtg  | 780  |
| 15 | gacctcgccc aggggcggga gcccagaccg gaggggctta gggccttcct ggagaggctg  | 840  |
|    | gagttcggca gcctcctcca cgagttcggc ctcttgagg ccccgcccc cctggaggag    | 900  |
| 20 | gccccctggc ccccgccgga aggggccttc gtgggcttcg tctctctccg ccccgagccc  | 960  |
|    | atgtgggagg agcttaaagc cctggccgac tgcagggacg gccgggtgca ccgggcagca  | 1020 |
|    | gacctcttgg cggggctaaa ggacctcaag gaggtccggg gcctcctcgc caaggacctc  | 1080 |
| 25 | gccgtcttgg cctcgaggga ggggctagac ctctgtcccg gggacgacct catgctcctc  | 1140 |
|    | gcctacctcc tggacctctc caacaccacc cccgaggggg tggcgcgggc ctacgggggg  | 1200 |
| 30 | gagtggacgg aggacggcg ccaccgggac ctctctcgg agaggctcca tcggaacctc    | 1260 |
|    | cttaagcgcc tcgaggggga ggagaagctc ctttggctct accacgaggt ggaaaagccc  | 1320 |
|    | ctctcccggg tcttgggcca catggaggcc accgggggtac ggcgggacgt ggcctacctt | 1380 |
| 35 | caggcccttt ccctggagct tgcggaggag atccgccgac tcgaggagga ggtcttccgc  | 1440 |
|    | ttggcgggcc accccttcaa cctcaactcc cgggaccagc tggaaagggg gctctttgac  | 1500 |
| 40 | gagcttaggc ttcccgctt gggaagacg caaaagacag gcaagcgctc caccagcgcc    | 1560 |
|    | gcggtgctgg aggccttacg ggaggccac cccatcgtgg agaagatcct ccagcaccgg   | 1620 |
|    | gagctacca agctcaagaa cacctacgtg gacccccctc caagcctcgt ccaccgagg    | 1680 |
| 45 | acggggccgc tccacaccg cttcaaccag acggccacgg ccacggggag gcttagtagc   | 1740 |
|    | tccgaccca acctgcagaa catccccgtc cgcacccccct tgggacagag gatccgcccg  | 1800 |
| 50 | gccttcgtgg ccgaggcggg ttgggcgttg gtggcccttg actatagcca gatagagctc  | 1860 |
|    | cgcgtcctcg cccacctctc cggggacgaa aacctgatca gggctttcca ggaggggaag  | 1920 |
|    | gacatccaca ccagaccgc aagctggatg ttcggcgctc ccccgagggc cgtggacccc   | 1980 |
| 55 | ctgatgcgcc gggcgggcaa gacggtgaac ttcggcgctc tctacggcat gtccgcccac  | 2040 |
|    | aggctctccc aggagcttgc catcccctac gaggaggcgg tggcctttat agagcgctac  | 2100 |
|    | ttccaaagct tccccaaagt gcgggccttg atagaaaaga ccctggagga ggggaggaag  | 2160 |
| 60 | cggggctacg tggaaaccct cttcggaaga aggcgctacg tgcccacact caacgcccgg  | 2220 |

|    |  |      |
|----|--|------|
|    | gtgaagagcg tcagggagggc cgcggagcgc atggccttca acatgcccgt ccagggcacc | 2280 |
|    | gccgccgacc tcatgaagct cgccatggtg aagctcttcc cccgcctccg ggagatgggg  | 2340 |
| 5  | gcccgcgatgc tcctccaggt ccacaacgag ctctctctgg agggccccca agcgcggggc | 2400 |
|    | gaggaggtgg cggcttttggc caaggaggcc atggagaagg cctatcccct cgccgtgccc | 2460 |
| 10 | ctggaggtgg aggtggggat gggggaggac tggcttttccg ccaagggtta g          | 2511 |
|    | <210> 13   |      |
| 15 | <211> 58   |      |
|    | <212> DNA  |      |
|    | <213> synthetic  |      |
| 20 | <400> 13   |      |
|    | tgcctgcagg tcgacgctag ctagtggtgg tgggtggtgg gacccttggc ggaaagcc    | 58   |
| 25 | <210> 14   |      |
|    | <211> 2526   |      |
|    | <212> DNA  |      |
| 30 | <213> Thermus thermophilus   |      |
|    | <400> 14   |      |
| 35 | atgaattccg aggcgatgct tccgctcttt gaacccaaag gccgggtcct cctggtggac  | 60   |
|    | ggccaccacc tggcctaccg caccttcttc gccctgaagg gcctcaccac gagccggggc  | 120  |
|    | gaaccggtgc aggcggtcta cggttcgcc aagagcctcc tcaaggccct gaaggaggac   | 180  |
| 40 | gggtacaagg ccgtcttcgt ggtctttgac gccaaaggccc cctccttccg ccacgaggcc | 240  |
|    | tacgaggcct acaaggcggg gagggccccg acccccagag acttcccccg gcagctcgcc  | 300  |
| 45 | ctcatcaagg agctggtgga cctcctgggg tttaccgcgc tcgaggtccc cggctacgag  | 360  |
|    | gcggacgacg ttctcgccac cctggccaag aaggcggaaa aggaggggta cgaggtgcgc  | 420  |
|    | atcctcaccg ccgaccgca cctctaccaa ctctgtctccg accggtcgc cgtcctccac   | 480  |
| 50 | cccgagggcc acctcatcac cccggagtgg ctttgggaga agtacggcct caggccggag  | 540  |
|    | cagtgggtgg acttccgcgc cctcgtgggg gaccctccg acaacctccc cgggggtcaag  | 600  |
| 55 | ggcatcgggg agaagaccgc cctcaagctc ctcaaggagt ggggaagcct ggaaaacctc  | 660  |
|    | ctcaagaacc tggaccgggt aaagccagaa aacgtccggg agaagatcaa ggcccacctg  | 720  |
|    | gaagacctca ggctctcctt ggagctctcc cgggtgcgca ccgacctccc cctggaggtg  | 780  |
| 60 | gacctcgccc aggggcggga gcccgaccgg gaggggctta gggccttccct ggagaggctg | 840  |

|    |  |      |
|----|--|------|
|    | gagttcggca gcctcctcca cgagttcggc ctcttgagg ccccgcccc cctggaggag    | 900  |
|    | gccccctggc ccccgccgga aggggccttc gtgggcttcg tcctctcccg ccccgagccc  | 960  |
| 5  | atgtgggcg agcttaaagc cctggccgcc tgcagggacg gccgggtgca ccgggcagca   | 1020 |
|    | gaccccttgg cggggctaaa ggacctcaag gaggtccggg gcctcctcgc caaggacctc  | 1080 |
| 10 | gccgtcttgg cctcgaggga ggggctagac ctctgtcccg gggacgacct catgctcctc  | 1140 |
|    | gcctacctcc tggacccctc caacaccacc cccgaggggg tggcgcggcg ctacgggggg  | 1200 |
|    | gagtggacgg aggacgcgc ccaccgggccc ctctctcgg agaggctcca tcggaacctc   | 1260 |
| 15 | cttaagcgcc tcgaggggga ggagaagctc ctttggctct accacgaggt ggaaaagccc  | 1320 |
|    | ctctcccggg tcctggccca catggaggcc accgggggtac ggcgggacgt ggcctacctt | 1380 |
| 20 | caggcccttt ccctggagct tgcggaggag atccgccgcc tcgaggagga ggtcttccgc  | 1440 |
|    | ttggcgggcc accccttcaa cctcaactcc cgggaccagc tggaaagggg gctctttgac  | 1500 |
|    | gagcttaggc ttccgcctt ggggaagacg caaaagacag gcaagcgctc caccagcgcc   | 1560 |
| 25 | gcggtgctgg aggccctacg ggaggccac cccatcgtgg agaagatcct ccagcaccgg   | 1620 |
|    | gagctacca agctcaagaa cacctacgtg gacccctcc caagcctcgt ccacccgagg    | 1680 |
| 30 | acgggcccgc tccacaccg cttcaaccag acggccacgg ccacggggag gcttagtagc   | 1740 |
|    | tccgaccca acctgcagaa catccccgtc cgcacccctc tgggccagag gatccgccgg   | 1800 |
|    | gccttcgtgg ccgaggcggg ttgggcgttg gtggcccttg actatagcca gatagagctc  | 1860 |
| 35 | cgcgctctcg cccacctctc cggggacgaa aacctgatca gggctttcca ggaggggaag  | 1920 |
|    | gacatccaca cccagaccgc aagctggatg ttcggcgctc ccccgaggc cgtggacccc   | 1980 |
| 40 | ctgatgcgcc gggcgccaa gacggtgaac ttcggcgctc tetacggcat gtccgcccat   | 2040 |
|    | aggctctccc aggagcttgc catcccctac gaggaggcgg tggcctttat agagcgctac  | 2100 |
|    | ttccaaagct tccccaaagt gcgggccttg atagaaaaga ccttgaggga ggggaggaag  | 2160 |
| 45 | cggggctacg tggaaaccct cttcggaaga aggcgctacg tggccgacct caacgcccgg  | 2220 |
|    | gtgaagagcg tcagggaggc cgcggagcgc atggccttca acatgcccgt ccagggcacc  | 2280 |
| 50 | gccgccgacc tcatgaagct cgccatggtg aagctcttcc cccgcctccg ggagatgggg  | 2340 |
|    | gcccgcacgc tcctccaggt ccacaacgag ctctccttg agggccccca agcgcgggcc   | 2400 |
|    | gaggaggtgg cggctttggc caaggaggcc atggagaagg cctatcccct cgccgtgccc  | 2460 |
| 55 | ctggaggtgg aggtggggat gggggaggac tggttttccg ccaagggta ccaccaccac   | 2520 |
|    | caccac   | 2526 |
| 60 | <210> 15   |      |
|    | <211> 842  |      |

<212> PRT

<213> Thermus thermophilus

5 <400> 15

|    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
|    | Met | Asn | Ser | Glu | Ala | Met | Leu | Pro | Leu | Phe | Glu | Pro | Lys | Gly | Arg | Val |  |
|    | 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |  |
| 10 | Leu | Leu | Val | Asp | Gly | His | His | Leu | Ala | Tyr | Arg | Thr | Phe | Phe | Ala | Leu |  |
|    |     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |  |
|    | Lys | Gly | Leu | Thr | Thr | Ser | Arg | Gly | Glu | Pro | Val | Gln | Ala | Val | Tyr | Gly |  |
|    |     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |  |
| 15 | Phe | Ala | Lys | Ser | Leu | Leu | Lys | Ala | Leu | Lys | Glu | Asp | Gly | Tyr | Lys | Ala |  |
|    |     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |  |
| 20 | Val | Phe | Val | Val | Phe | Asp | Ala | Lys | Ala | Pro | Ser | Phe | Arg | His | Glu | Ala |  |
|    | 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |  |
|    | Tyr | Glu | Ala | Tyr | Lys | Ala | Gly | Arg | Ala | Pro | Thr | Pro | Glu | Asp | Phe | Pro |  |
|    |     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |  |
| 25 | Arg | Gln | Leu | Ala | Leu | Ile | Lys | Glu | Leu | Val | Asp | Leu | Leu | Gly | Phe | Thr |  |
|    |     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |  |
|    | Arg | Leu | Glu | Val | Pro | Gly | Tyr | Glu | Ala | Asp | Asp | Val | Leu | Ala | Thr | Leu |  |
|    |     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |  |
| 30 | Ala | Lys | Lys | Ala | Glu | Lys | Glu | Gly | Tyr | Glu | Val | Arg | Ile | Leu | Thr | Ala |  |
|    |     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |  |
|    | Asp | Arg | Asp | Leu | Tyr | Gln | Leu | Val | Ser | Asp | Arg | Val | Ala | Val | Leu | His |  |
| 35 | 145 |     |     |     |     | 150 |     |     |     | 155 |     |     |     |     |     | 160 |  |
|    | Pro | Glu | Gly | His | Leu | Ile | Thr | Pro | Glu | Trp | Leu | Trp | Glu | Lys | Tyr | Gly |  |
|    |     |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |  |
| 40 | Leu | Arg | Pro | Glu | Gln | Trp | Val | Asp | Phe | Arg | Ala | Leu | Val | Gly | Asp | Pro |  |
|    |     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |  |
|    | Ser | Asp | Asn | Leu | Pro | Gly | Val | Lys | Gly | Ile | Gly | Glu | Lys | Thr | Ala | Leu |  |
|    |     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |  |
| 45 | Lys | Leu | Leu | Lys | Glu | Trp | Gly | Ser | Leu | Glu | Asn | Leu | Leu | Lys | Asn | Leu |  |
|    |     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |  |
|    | Asp | Arg | Val | Lys | Pro | Glu | Asn | Val | Arg | Glu | Lys | Ile | Lys | Ala | His | Leu |  |
| 50 | 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |  |
|    | Glu | Asp | Leu | Arg | Leu | Ser | Leu | Glu | Leu | Ser | Arg | Val | Arg | Thr | Asp | Leu |  |
|    |     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |  |
| 55 | Pro | Leu | Glu | Val | Asp | Leu | Ala | Gln | Gly | Arg | Glu | Pro | Asp | Arg | Glu | Gly |  |
|    |     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |  |
|    | Leu | Arg | Ala | Phe | Leu | Glu | Arg | Leu | Glu | Phe | Gly | Ser | Leu | Leu | His | Glu |  |
|    |     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |  |
| 60 | Phe | Gly | Leu | Leu | Glu | Ala | Pro | Ala | Pro | Leu | Glu | Glu | Ala | Pro | Trp | Pro |  |
|    |     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |  |

|    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
|    | Pro | Pro | Glu | Gly | Ala | Phe | Val | Gly | Phe | Val | Leu | Ser | Arg | Pro | Glu | Pro |  |
|    | 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |  |
| 5  | Met | Trp | Ala | Glu | Leu | Lys | Ala | Leu | Ala | Ala | Cys | Arg | Asp | Gly | Arg | Val |  |
|    |     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |  |
|    | His | Arg | Ala | Ala | Asp | Pro | Leu | Ala | Gly | Leu | Lys | Asp | Leu | Lys | Glu | Val |  |
|    |     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |  |
| 10 | Arg | Gly | Leu | Leu | Ala | Lys | Asp | Leu | Ala | Val | Leu | Ala | Ser | Arg | Glu | Gly |  |
|    |     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |  |
|    | Leu | Asp | Leu | Val | Pro | Gly | Asp | Asp | Pro | Met | Leu | Leu | Ala | Tyr | Leu | Leu |  |
|    |     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |  |
| 15 | Asp | Pro | Ser | Asn | Thr | Thr | Pro | Glu | Gly | Val | Ala | Arg | Arg | Tyr | Gly | Gly |  |
|    | 385 |     |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |  |
|    | Glu | Trp | Thr | Glu | Asp | Ala | Ala | His | Arg | Ala | Leu | Leu | Ser | Glu | Arg | Leu |  |
|    |     |     |     |     | 405 |     |     |     |     | 410 |     |     |     |     | 415 |     |  |
| 20 | His | Arg | Asn | Leu | Leu | Lys | Arg | Leu | Glu | Gly | Glu | Glu | Lys | Leu | Leu | Trp |  |
|    |     |     | 420 |     |     |     |     |     | 425 |     |     |     |     | 430 |     |     |  |
| 25 | Leu | Tyr | His | Glu | Val | Glu | Lys | Pro | Leu | Ser | Arg | Val | Leu | Ala | His | Met |  |
|    |     |     | 435 |     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |  |
|    | Glu | Ala | Thr | Gly | Val | Arg | Arg | Asp | Val | Ala | Tyr | Leu | Gln | Ala | Leu | Ser |  |
|    |     | 450 |     |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |  |
| 30 | Leu | Glu | Leu | Ala | Glu | Glu | Ile | Arg | Arg | Leu | Glu | Glu | Glu | Val | Phe | Arg |  |
|    |     | 465 |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |  |
|    | Leu | Ala | Gly | His | Pro | Phe | Asn | Leu | Asn | Ser | Arg | Asp | Gln | Leu | Glu | Arg |  |
|    |     |     |     |     | 485 |     |     |     |     | 490 |     |     |     |     | 495 |     |  |
| 35 | Val | Leu | Phe | Asp | Glu | Leu | Arg | Leu | Pro | Ala | Leu | Gly | Lys | Thr | Gln | Lys |  |
|    |     |     |     | 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |  |
| 40 | Thr | Gly | Lys | Arg | Ser | Thr | Ser | Ala | Ala | Val | Leu | Glu | Ala | Leu | Arg | Glu |  |
|    |     |     | 515 |     |     |     |     | 520 |     |     |     |     | 525 |     |     |     |  |
|    | Ala | His | Pro | Ile | Val | Glu | Lys | Ile | Leu | Gln | His | Arg | Glu | Leu | Thr | Lys |  |
|    |     | 530 |     |     |     |     | 535 |     |     |     |     | 540 |     |     |     |     |  |
| 45 | Leu | Lys | Asn | Thr | Tyr | Val | Asp | Pro | Leu | Pro | Ser | Leu | Val | His | Pro | Arg |  |
|    |     | 545 |     |     |     | 550 |     |     |     |     | 555 |     |     |     |     | 560 |  |
|    | Thr | Gly | Arg | Leu | His | Thr | Arg | Phe | Asn | Gln | Thr | Ala | Thr | Ala | Thr | Gly |  |
|    |     |     |     |     | 565 |     |     |     |     | 570 |     |     |     |     | 575 |     |  |
| 50 | Arg | Leu | Ser | Ser | Ser | Asp | Pro | Asn | Leu | Gln | Asn | Ile | Pro | Val | Arg | Thr |  |
|    |     |     |     | 580 |     |     |     |     | 585 |     |     |     |     | 590 |     |     |  |
| 55 | Pro | Leu | Gly | Gln | Arg | Ile | Arg | Arg | Ala | Phe | Val | Ala | Glu | Ala | Gly | Trp |  |
|    |     |     | 595 |     |     |     |     | 600 |     |     |     |     | 605 |     |     |     |  |
|    | Ala | Leu | Val | Ala | Leu | Asp | Tyr | Ser | Gln | Ile | Glu | Leu | Arg | Val | Leu | Ala |  |
|    |     | 610 |     |     |     |     | 615 |     |     |     |     | 620 |     |     |     |     |  |
| 60 | His | Leu | Ser | Gly | Asp | Glu | Asn | Leu | Ile | Arg | Val | Phe | Gln | Glu | Gly | Lys |  |
|    |     | 625 |     |     |     | 630 |     |     |     |     | 635 |     |     |     |     | 640 |  |

|    |                                    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
|----|------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
|    | Asp                                | Ile | His | Thr | Gln | Thr | Ala | Ser | Trp | Met | Phe | Gly | Val | Pro | Pro | Glu |    |
|    |                                    |     |     |     | 645 |     |     |     |     | 650 |     |     |     |     | 655 |     |    |
| 5  | Ala                                | Val | Asp | Pro | Leu | Met | Arg | Arg | Ala | Ala | Lys | Thr | Val | Asn | Phe | Gly |    |
|    |                                    |     |     | 660 |     |     |     |     | 665 |     |     |     |     | 670 |     |     |    |
|    | Val                                | Leu | Tyr | Gly | Met | Ser | Ala | His | Arg | Leu | Ser | Gln | Glu | Leu | Ala | Ile |    |
|    |                                    |     | 675 |     |     |     |     | 680 |     |     |     |     | 685 |     |     |     |    |
| 10 | Pro                                | Tyr | Glu | Glu | Ala | Val | Ala | Phe | Ile | Glu | Arg | Tyr | Phe | Gln | Ser | Phe |    |
|    |                                    | 690 |     |     |     |     | 695 |     |     |     |     | 700 |     |     |     |     |    |
|    | Pro                                | Lys | Val | Arg | Ala | Trp | Ile | Glu | Lys | Thr | Leu | Glu | Glu | Gly | Arg | Lys |    |
|    |                                    | 705 |     |     |     | 710 |     |     |     |     | 715 |     |     |     | 720 |     |    |
| 15 | Arg                                | Gly | Tyr | Val | Glu | Thr | Leu | Phe | Gly | Arg | Arg | Arg | Tyr | Val | Pro | Asp |    |
|    |                                    |     |     | 725 |     |     |     |     | 730 |     |     |     |     |     | 735 |     |    |
|    | Leu                                | Asn | Ala | Arg | Val | Lys | Ser | Val | Arg | Glu | Ala | Ala | Glu | Arg | Met | Ala |    |
| 20 |                                    |     | 740 |     |     |     |     |     | 745 |     |     |     |     | 750 |     |     |    |
|    | Phe                                | Asn | Met | Pro | Val | Gln | Gly | Thr | Ala | Ala | Asp | Leu | Met | Lys | Leu | Ala |    |
|    |                                    | 755 |     |     |     |     | 760 |     |     |     |     |     | 765 |     |     |     |    |
| 25 | Met                                | Val | Lys | Leu | Phe | Pro | Arg | Leu | Arg | Glu | Met | Gly | Ala | Arg | Met | Leu |    |
|    |                                    | 770 |     |     |     |     | 775 |     |     |     |     | 780 |     |     |     |     |    |
|    | Leu                                | Gln | Val | His | Asn | Glu | Leu | Leu | Leu | Glu | Ala | Pro | Gln | Ala | Arg | Ala |    |
|    |                                    | 785 |     |     |     | 790 |     |     |     |     | 795 |     |     |     |     | 800 |    |
| 30 | Glu                                | Glu | Val | Ala | Ala | Leu | Ala | Lys | Glu | Ala | Met | Glu | Lys | Ala | Tyr | Pro |    |
|    |                                    |     |     | 805 |     |     |     |     |     | 810 |     |     |     |     | 815 |     |    |
|    | Leu                                | Ala | Val | Pro | Leu | Glu | Val | Glu | Val | Gly | Met | Gly | Glu | Asp | Trp | Leu |    |
| 35 |                                    |     | 820 |     |     |     |     |     | 825 |     |     |     |     | 830 |     |     |    |
|    | Ser                                | Ala | Lys | Gly | His | His | His | His | His | His |     |     |     |     |     |     |    |
|    |                                    |     | 835 |     |     |     |     | 840 |     |     |     |     |     |     |     |     |    |
| 40 |                                    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
|    | <210> 16                           |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
|    | <211> 31                           |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
| 45 | <212> DNA                          |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
|    | <213> synthetic                    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
|    | <400> 16                           |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
| 50 | gcctgcaggg gcggccgcgt gcaccggggc a |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 31 |
|    | <210> 17                           |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
| 55 | <211> 26                           |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
|    | <212> DNA                          |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
| 60 | <213> synthetic                    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
|    | <400> 17                           |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |

|    |  |      |
|----|--|------|
|    | ctcctggacc cttcgaacac cacccc                                       | 26   |
| 5  | <210> 18   |      |
|    | <211> 23   |      |
|    | <212> DNA  |      |
| 10 | <213> synthetic  |      |
|    | <400> 18   |      |
| 15 | gtcctggccc atatggaggc cac  | 23   |
|    | <210> 19   |      |
| 20 | <211> 2526   |      |
|    | <212> DNA  |      |
|    | <213> Thermus thermophilus   |      |
| 25 | <400> 19   |      |
| 30 | atgaattccg aggcgatgct tccgctcttt gaacccaaag gccgggtcct cctgggtggac | 60   |
|    | ggccaccacc tggcctaccg caccttcttc gcctgaagg gcctcaccac gagccggggc   | 120  |
|    | gaaccggtgc aggcggtcta cggttcgcc aagagcctcc tcaaggccct gaaggaggac   | 180  |
|    | gggtacaagg ccgtcttcgt ggtctttgac gccaaggccc cctccttcgc ccacgaggcc  | 240  |
| 35 | tacgaggcct acaaggcggg gagggccccg acccccagagg acttccccgc gcagctcgcc | 300  |
|    | ctcatcaagg agctggtgga cctcctgggg tttaccgcgc tcgaggtccc cggctacgag  | 360  |
| 40 | gcgacgacg ttctcgccac cctggccaag aaggcggaaa aggaggggta cgaggtgcgc   | 420  |
|    | atcctcaccg ccgaccgcga cctctaccaa ctctgtctcc accgcgtcgc cgtcctccac  | 480  |
|    | cccagggggc acctcatcac cccggagtgg ctttgggaga agtacggcct caggccggag  | 540  |
| 45 | cagtgggtgg acttccgcgc cctcgtgggg gaccctccg acaacctccc cggggtcaag   | 600  |
|    | ggcatcgggg agaagaccgc cctcaagctc ctcaaggagt ggggaagcct ggaaaacctc  | 660  |
|    | ctcaagaacc tggaccgggt aaagccagaa aacgtccggg agaagatcaa ggcccacctg  | 720  |
| 50 | gaagacctca ggctctcctt ggagctctcc cgggtgcgca ccgacctccc cctggaggtg  | 780  |
|    | gacctcgccc aggggcggga gcccgaccgg gaggggctta gggccttccg ggagaggctg  | 840  |
| 55 | gagttcggca gcctcctcca cgagttcggc ctcttgagg cccccgcccc cctggaggag   | 900  |
|    | gccccctggc ccccgccgga aggggccttc gtgggcttcg tcctctcccg ccccgagccc  | 960  |
|    | atgtgggcgg agcttaaagc cctggccgcc tgcaggggcg gccgcgtgca ccgggcagca  | 1020 |
| 60 | gacccttggt cggggctaaa ggacctcaag gaggtccggg gcctcctcgc caaggacctc  | 1080 |



|    |   |      |
|----|---|------|
|    | gccgtcttgg cctcgagggga ggggctagac ctcgtgcccc gggacgaccc catgctcctc  | 1140 |
|    | gcctacctcc tggacccttc gaacaccacc cccgaggggg tggcgcggcg ctacgggggg   | 1200 |
| 5  | gagtggacgg aggacgcccgc ccaccggggc ctcctctcgg agaggctcca tcggaacctc  | 1260 |
|    | cttaagcgcc tcgagggggga ggagaagctc ctttggctct accacgaggt ggaaaagccc  | 1320 |
| 10 | ctctccccggg tcctggccca tatggaggcc accgggggtac ggcgggacgt ggcctacctt | 1380 |
|    | caggcccttt ccctggagct tgcggaggag atccgccgcc tcgaggagga ggtcttccgc   | 1440 |
|    | ttggcgggcc accccttcaa cctcaactcc cgggaccagc tggaaagggg gctctttgac   | 1500 |
| 15 | gagcttaggc ttcccgctt ggggaagacg caaaagacag gcaagcgctc caccagcgcc    | 1560 |
|    | gcggtgctgg aggccctacg ggaggccac cccatcgtgg agaagatcct ccagcaccgg    | 1620 |
| 20 | gagctacca agctcaagaa cacctacgtg gacccccctc caagcctcgt ccaccgagg     | 1680 |
|    | acgggcccgc tccacaccgc cttcaaccag acggccacgg ccacggggag gcttagtagc   | 1740 |
|    | tccgaccca acctgcagaa catccccgtc cgcacccccct tgggccagag gatccgccgg   | 1800 |
| 25 | gccttcgtgg ccgaggcggg ttgggcgttg gtggccctgg actatagcca gatagagctc   | 1860 |
|    | cgcgtcctcg ccacacctc cggggacgaa aacctgatca gggctttcca ggaggggaag    | 1920 |
| 30 | gacatccaca ccagaccgc aagctggatg ttcggcgctc ccccgaggc cgtggacccc     | 1980 |
|    | ctgatgcgcc gggcgccaa gacggtgaac ttcggcgctc tctacggcat gtccgcccac    | 2040 |
|    | aggctctccc aggagcttgc catccccctac gaggaggcgg tggcctttat agagcgctac  | 2100 |
| 35 | ttccaaagct tccccaaggt gcgggcctgg atagaaaaga ccctggagga ggggaggaag   | 2160 |
|    | cggggctacg tggaaaccct cttcggaaga aggcgctacg tgcccgcact caacgcccgg   | 2220 |
| 40 | gtgaagagcg tcagggaggc cgcggagcgc atggccttca acatgcccgt ccagggcacc   | 2280 |
|    | gccgccgacc tcatgaagct cgccatggtg aagctcttcc cccgcctccg ggagatgggg   | 2340 |
|    | gcccgcacgc tcctccaggt ccacaacgag ctctctctgg agggccccca agcgcggggc   | 2400 |
| 45 | gaggaggtgg cggctttggc caaggaggcc atggagaagg cctatcccct cgccgtgccc   | 2460 |
|    | ctggaggtgg aggtggggat gggggaggac tggctttccg ccaagggta ccaccaccac    | 2520 |
| 50 | caccac  | 2526 |
|    | <210> 20  |      |
|    | <211> 842   |      |
| 55 | <212> PRT   |      |
|    | <213> Thermus thermophilus  |      |
| 60 | <400> 20  |      |
|    | Met Asn Ser Glu Ala Met Leu Pro Leu Phe Glu Pro Lys Gly Arg Val     |      |

|    | 1           | 5                               | 10                                  | 15                              |
|----|-------------|---------------------------------|-------------------------------------|---------------------------------|
|    | Leu         | Leu Val                         | Asp Gly His His Leu                 | Ala Tyr Arg Thr Phe Phe Ala Leu |
|    |             | 20                              | 25                                  | 30                              |
| 5  | Lys Gly Leu | Thr Thr Ser Arg Gly             | Glu Pro Val Gln Ala Val Tyr Gly     |                                 |
|    | 35          | 40                              | 45                                  |                                 |
| 10 | Phe Ala Lys | Ser Leu Leu Lys                 | Ala Leu Lys Glu Asp Gly Tyr Lys Ala |                                 |
|    | 50          | 55                              | 60                                  |                                 |
|    | Val Phe Val | Val Phe Asp Ala Lys             | Ala Pro Ser Phe Arg His Glu Ala     |                                 |
|    | 65          | 70                              | 75                                  | 80                              |
| 15 | Tyr Glu Ala | Tyr Lys Ala Gly Arg Ala         | Pro Thr Pro Glu Asp Phe Pro         |                                 |
|    |             | 85                              | 90                                  | 95                              |
|    | Arg Gln Leu | Ala Leu Ile Lys Glu             | Leu Val Asp Leu Leu Gly Phe Thr     |                                 |
|    | 100         | 105                             | 110                                 |                                 |
| 20 | Arg Leu Glu | Val Pro Gly Tyr Glu             | Ala Asp Asp Val Leu Ala Thr Leu     |                                 |
|    | 115         | 120                             | 125                                 |                                 |
|    | Ala Lys Lys | Ala Glu Lys Glu Gly Tyr Glu     | Val Arg Ile Leu Thr Ala             |                                 |
|    | 130         | 135                             | 140                                 |                                 |
| 25 | Asp Arg Asp | Leu Tyr Gln Leu Val Ser Asp     | Arg Val Ala Val Leu His             |                                 |
|    | 145         | 150                             | 155                                 | 160                             |
| 30 | Pro Glu Gly | His Leu Ile Thr Pro Glu Trp     | Leu Trp Glu Lys Tyr Gly             |                                 |
|    |             | 165                             | 170                                 | 175                             |
|    | Leu Arg Pro | Glu Gln Trp Val Asp Phe Arg     | Ala Leu Val Gly Asp Pro             |                                 |
|    | 180         | 185                             | 190                                 |                                 |
| 35 | Ser Asp Asn | Leu Pro Gly Val Lys Gly Ile Gly | Glu Lys Thr Ala Leu                 |                                 |
|    | 195         | 200                             | 205                                 |                                 |
|    | Lys Leu Leu | Lys Glu Trp Gly Ser Leu Glu Asn | Leu Leu Lys Asn Leu                 |                                 |
|    | 210         | 215                             | 220                                 |                                 |
| 40 | Asp Arg Val | Lys Pro Glu Asn Val Arg Glu Lys | Ile Lys Ala His Leu                 |                                 |
|    | 225         | 230                             | 235                                 | 240                             |
| 45 | Glu Asp Leu | Arg Leu Ser Leu Glu Leu Ser Arg | Val Arg Thr Asp Leu                 |                                 |
|    |             | 245                             | 250                                 | 255                             |
|    | Pro Leu Glu | Val Asp Leu Ala Gln Gly Arg Glu | Pro Asp Arg Glu Gly                 |                                 |
|    | 260         | 265                             | 270                                 |                                 |
| 50 | Leu Arg Ala | Phe Leu Glu Arg Leu Glu Phe Gly | Ser Leu Leu His Glu                 |                                 |
|    | 275         | 280                             | 285                                 |                                 |
|    | Phe Gly Leu | Leu Glu Ala Pro Ala Pro Leu Glu | Glu Ala Pro Trp Pro                 |                                 |
|    | 290         | 295                             | 300                                 |                                 |
| 55 | Pro Pro Glu | Gly Ala Phe Val Gly Phe Val Leu | Ser Arg Pro Glu Pro                 |                                 |
|    | 305         | 310                             | 315                                 | 320                             |
| 60 | Met Trp Ala | Glu Leu Lys Ala Leu Ala Ala Cys | Arg Gly Gly Arg Val                 |                                 |
|    |             | 325                             | 330                                 | 335                             |

|    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
|    | His | Arg | Ala | Ala | Asp | Pro | Leu | Ala | Gly | Leu | Lys | Asp | Leu | Lys | Glu | Val |  |
|    |     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |  |
| 5  | Arg | Gly | Leu | Leu | Ala | Lys | Asp | Leu | Ala | Val | Leu | Ala | Ser | Arg | Glu | Gly |  |
|    |     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |  |
|    | Leu | Asp | Leu | Val | Pro | Gly | Asp | Asp | Pro | Met | Leu | Leu | Ala | Tyr | Leu | Leu |  |
|    |     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |  |
| 10 | Asp | Pro | Ser | Asn | Thr | Thr | Pro | Glu | Gly | Val | Ala | Arg | Arg | Tyr | Gly | Gly |  |
|    |     | 385 |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |  |
|    | Glu | Trp | Thr | Glu | Asp | Ala | Ala | His | Arg | Ala | Leu | Leu | Ser | Glu | Arg | Leu |  |
|    |     |     |     | 405 |     |     |     |     | 410 |     |     |     |     |     | 415 |     |  |
| 15 | His | Arg | Asn | Leu | Leu | Lys | Arg | Leu | Glu | Gly | Glu | Glu | Lys | Leu | Leu | Trp |  |
|    |     |     | 420 |     |     |     |     |     | 425 |     |     |     |     | 430 |     |     |  |
| 20 | Leu | Tyr | His | Glu | Val | Glu | Lys | Pro | Leu | Ser | Arg | Val | Leu | Ala | His | Met |  |
|    |     | 435 |     |     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |  |
|    | Glu | Ala | Thr | Gly | Val | Arg | Arg | Asp | Val | Ala | Tyr | Leu | Gln | Ala | Leu | Ser |  |
|    |     | 450 |     |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |  |
| 25 | Leu | Glu | Leu | Ala | Glu | Glu | Ile | Arg | Arg | Leu | Glu | Glu | Glu | Val | Phe | Arg |  |
|    |     | 465 |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |  |
|    | Leu | Ala | Gly | His | Pro | Phe | Asn | Leu | Asn | Ser | Arg | Asp | Gln | Leu | Glu | Arg |  |
|    |     |     |     | 485 |     |     |     |     | 490 |     |     |     |     |     | 495 |     |  |
| 30 | Val | Leu | Phe | Asp | Glu | Leu | Arg | Leu | Pro | Ala | Leu | Gly | Lys | Thr | Gln | Lys |  |
|    |     |     | 500 |     |     |     |     |     | 505 |     |     |     |     | 510 |     |     |  |
|    | Thr | Gly | Lys | Arg | Ser | Thr | Ser | Ala | Ala | Val | Leu | Glu | Ala | Leu | Arg | Glu |  |
| 35 |     |     | 515 |     |     |     |     | 520 |     |     |     |     | 525 |     |     |     |  |
|    | Ala | His | Pro | Ile | Val | Glu | Lys | Ile | Leu | Gln | His | Arg | Glu | Leu | Thr | Lys |  |
|    |     | 530 |     |     |     |     | 535 |     |     |     |     | 540 |     |     |     |     |  |
| 40 | Leu | Lys | Asn | Thr | Tyr | Val | Asp | Pro | Leu | Pro | Ser | Leu | Val | His | Pro | Arg |  |
|    |     | 545 |     |     |     | 550 |     |     |     |     | 555 |     |     |     |     | 560 |  |
|    | Thr | Gly | Arg | Leu | His | Thr | Arg | Phe | Asn | Gln | Thr | Ala | Thr | Ala | Thr | Gly |  |
|    |     |     |     | 565 |     |     |     |     | 570 |     |     |     |     |     | 575 |     |  |
| 45 | Arg | Leu | Ser | Ser | Ser | Asp | Pro | Asn | Leu | Gln | Asn | Ile | Pro | Val | Arg | Thr |  |
|    |     |     | 580 |     |     |     |     |     | 585 |     |     |     |     | 590 |     |     |  |
|    | Pro | Leu | Gly | Gln | Arg | Ile | Arg | Arg | Ala | Phe | Val | Ala | Glu | Ala | Gly | Trp |  |
| 50 |     |     | 595 |     |     |     |     | 600 |     |     |     |     | 605 |     |     |     |  |
|    | Ala | Leu | Val | Ala | Leu | Asp | Tyr | Ser | Gln | Ile | Glu | Leu | Arg | Val | Leu | Ala |  |
|    |     | 610 |     |     |     |     | 615 |     |     |     |     | 620 |     |     |     |     |  |
| 55 | His | Leu | Ser | Gly | Asp | Glu | Asn | Leu | Ile | Arg | Val | Phe | Gln | Glu | Gly | Lys |  |
|    |     | 625 |     |     |     | 630 |     |     |     |     | 635 |     |     |     |     | 640 |  |
|    | Asp | Ile | His | Thr | Gln | Thr | Ala | Ser | Trp | Met | Phe | Gly | Val | Pro | Pro | Glu |  |
|    |     |     |     | 645 |     |     |     |     |     | 650 |     |     |     |     | 655 |     |  |
| 60 | Ala | Val | Asp | Pro | Leu | Met | Arg | Arg | Ala | Ala | Lys | Thr | Val | Asn | Phe | Gly |  |
|    |     |     | 660 |     |     |     |     |     | 665 |     |     |     |     | 670 |     |     |  |

|    |            |                      |            |            |            |            |     |     |     |     |     |     |     |     |     |     |     |
|----|------------|----------------------|------------|------------|------------|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|    | Val        | Leu                  | Tyr        | Gly        | Met        | Ser        | Ala | His | Arg | Leu | Ser | Gln | Glu | Leu | Ala | Ile |     |
|    |            |                      | 675        |            |            |            |     | 680 |     |     |     |     | 685 |     |     |     |     |
| 5  | Pro        | Tyr                  | Glu        | Glu        | Ala        | Val        | Ala | Phe | Ile | Glu | Arg | Tyr | Phe | Gln | Ser | Phe |     |
|    |            | 690                  |            |            |            |            | 695 |     |     |     |     | 700 |     |     |     |     |     |
|    | Pro        | Lys                  | Val        | Arg        | Ala        | Trp        | Ile | Glu | Lys | Thr | Leu | Glu | Glu | Gly | Arg | Lys |     |
|    |            | 705                  |            |            |            | 710        |     |     |     |     | 715 |     |     |     |     | 720 |     |
| 10 | Arg        | Gly                  | Tyr        | Val        | Glu        | Thr        | Leu | Phe | Gly | Arg | Arg | Arg | Tyr | Val | Pro | Asp |     |
|    |            |                      |            |            | 725        |            |     |     |     | 730 |     |     |     |     | 735 |     |     |
|    | Leu        | Asn                  | Ala        | Arg        | Val        | Lys        | Ser | Val | Arg | Glu | Ala | Ala | Glu | Arg | Met | Ala |     |
|    |            |                      |            | 740        |            |            |     |     | 745 |     |     |     |     | 750 |     |     |     |
| 15 | Phe        | Asn                  | Met        | Pro        | Val        | Gln        | Gly | Thr | Ala | Ala | Asp | Leu | Met | Lys | Leu | Ala |     |
|    |            |                      | 755        |            |            |            |     | 760 |     |     |     |     | 765 |     |     |     |     |
|    | Met        | Val                  | Lys        | Leu        | Phe        | Pro        | Arg | Leu | Arg | Glu | Met | Gly | Ala | Arg | Met | Leu |     |
| 20 |            | 770                  |            |            |            |            | 775 |     |     |     |     | 780 |     |     |     |     |     |
|    | Leu        | Gln                  | Val        | His        | Asn        | Glu        | Leu | Leu | Leu | Glu | Ala | Pro | Gln | Ala | Arg | Ala |     |
|    |            |                      |            |            |            | 790        |     |     |     |     | 795 |     |     |     |     | 800 |     |
| 25 | Glu        | Glu                  | Val        | Ala        | Ala        | Leu        | Ala | Lys | Glu | Ala | Met | Glu | Lys | Ala | Tyr | Pro |     |
|    |            |                      |            |            | 805        |            |     |     |     | 810 |     |     |     |     | 815 |     |     |
|    | Leu        | Ala                  | Val        | Pro        | Leu        | Glu        | Val | Glu | Val | Gly | Met | Gly | Glu | Asp | Trp | Leu |     |
|    |            |                      |            | 820        |            |            |     |     |     | 825 |     |     |     | 830 |     |     |     |
| 30 | Ser        | Ala                  | Lys        | Gly        | His        | His        | His | His | His | His | His | His | His | His | His | His |     |
|    |            |                      | 835        |            |            |            |     |     |     | 840 |     |     |     |     |     |     |     |
| 35 | <210>      | 21                   |            |            |            |            |     |     |     |     |     |     |     |     |     |     |     |
|    | <211>      | 30                   |            |            |            |            |     |     |     |     |     |     |     |     |     |     |     |
|    | <212>      | DNA                  |            |            |            |            |     |     |     |     |     |     |     |     |     |     |     |
| 40 | <213>      | synthetic            |            |            |            |            |     |     |     |     |     |     |     |     |     |     |     |
|    | <400>      | 21                   |            |            |            |            |     |     |     |     |     |     |     |     |     |     |     |
| 45 | caggaggagc | tcggttgccga          | cctggaggag |            |            |            |     |     |     |     |     |     |     |     |     |     | 30  |
|    | <210>      | 22                   |            |            |            |            |     |     |     |     |     |     |     |     |     |     |     |
| 50 | <211>      | 2526                 |            |            |            |            |     |     |     |     |     |     |     |     |     |     |     |
|    | <212>      | DNA                  |            |            |            |            |     |     |     |     |     |     |     |     |     |     |     |
|    | <213>      | Thermus thermophilus |            |            |            |            |     |     |     |     |     |     |     |     |     |     |     |
| 55 | <400>      | 22                   |            |            |            |            |     |     |     |     |     |     |     |     |     |     |     |
|    | atgaattccg | aggcgatgct           | tccgctcttt | gaacccaaag | gccgggtcct | cctggtggac |     |     |     |     |     |     |     |     |     |     | 60  |
| 60 | ggccaccacc | tggcctaccg           | caccttcttc | gcctgaagg  | gcctcaccac | gagccggggc |     |     |     |     |     |     |     |     |     |     | 120 |
|    | gaaccggtgc | aggcggtcta           | cggcttcgcc | aagagcctcc | tcaaggccct | gaaggaggac |     |     |     |     |     |     |     |     |     |     | 180 |

|    |  |      |
|----|--|------|
|    | gggtacaagg ccgtcttcgt ggtctttgac gccaaaggccc cctccttccg ccacgaggcc | 240  |
|    | tacgaggcct acaaggcggg gagggcccg acccccgagg acttccccg gcagctcgcc    | 300  |
| 5  | ctcatcaagg agctggtgga cctcctgggg tttaccgcc tcgagggtccc cggctacgag  | 360  |
|    | gcggacgacg ttctcgccac cctggccaag aaggcggaag aggaggggta cgagggtgagc | 420  |
| 10 | atcctcaccg ccgaccgga cctctaccaa ctctgtctccg accgctcgc cgtcctccac   | 480  |
|    | cccgagggcc acctcatcac cccggagtgg ctttgggaga agtacggcct caggccggag  | 540  |
|    | cagtgggtgg acttccgcgc cctcgtgggg gaccctccg acaacctccc cgggggtcaag  | 600  |
| 15 | ggcatcgggg agaagaccgc cctcaagctc ctcaaggagt ggggaagcct ggaaaacctc  | 660  |
|    | ctcaagaacc tggaccgggt aaagccagaa aacgtccggg agaagatcaa ggcccacctg  | 720  |
| 20 | gaagacctca ggctctcctt ggagctctcc cgggtgcgca ccgacctccc cctggagggtg | 780  |
|    | gacctcgccc aggggcggga gcccagccgg gaggggctta gggccttcc cctggagggtg  | 840  |
|    | gagttcggca gcctcctcca cgagttcggc ctctggagg ccccgcccc cctggaggag    | 900  |
| 25 | gccccctggc ccccgccgga aggggccttc gtgggcttcg tcctctccc ccccgagccc   | 960  |
|    | atgtgggcgg agcttaaagc cctggccgcc tgcagggcg gccgctgca ccgggcagca    | 1020 |
|    | gacctcttg cggggctaaa ggacctcaag gaggtccggg gcctcctcgc caaggacctc   | 1080 |
| 30 | gccgtcttg cctcgaggga ggggctagac ctctgcccg gggacgacc catgctcctc     | 1140 |
|    | gcctacctcc tggaccttc gaacaccacc cccgaggggg tggcgcgcg ctacgggggg    | 1200 |
| 35 | gagtggacgg aggacccgc ccaccgggcc ctctctcgg agaggctcca tcggaacctc    | 1260 |
|    | cttaagcgcc tcgaggggga ggagaagctc ctttggctct accacgaggt ggaaaagccc  | 1320 |
| 40 | ctctcccggg tcctggccca tatggaggcc accggggtac ggcgggacgt ggcctacctt  | 1380 |
|    | caggcccttt ccctggagct tgcggaggag atccgcgcc tcgaggagga ggtcttccgc   | 1440 |
|    | ttggcgggcc acccttcaa cctcaactcc cgggaccagc tggaaaggg gctctttgac    | 1500 |
| 45 | gagcttaggc ttccgcctt ggggaagacg caaaagacag gcaagcgtc caccagcgcc    | 1560 |
|    | gcggtgctgg aggccctacg ggaggccac cccatcgtgg agaagatcct ccagcacggg   | 1620 |
| 50 | gagctacca agctcaagaa cacctacgtg gacccctcc caagcctcgt ccaccgagg     | 1680 |
|    | acgggcccgc tccacaccg cttcaaccag acggccacgg ccacggggag gcttagtagc   | 1740 |
|    | tccgaccca acctgcagaa catccccgtc cgcacccctc tgggccagag gatccgcggg   | 1800 |
| 55 | gccttcgtgg ccgaggcggg ttgggcgttg gtggccctgg actatagcca gatagagctc  | 1860 |
|    | cgcgtcctcg cccacctctc cggggacgaa aacctgatca gggcttcca ggaggggaag   | 1920 |
|    | gacatccaca cccagaccgc aagctggatg ttcggcgctc ccccgaggc cgtggacccc   | 1980 |
| 60 | ctgatgcgcc gggcgccaa gacggtgaac ttcggcgctc tctacggcat gtccgcccac   | 2040 |

5 aggctctccc aggagcttgc catcccctac gaggaggcgg tggcctttat agagcgctac 2100  
 ttccaaagct tccccaaggt gcgggcctgg atagaaaaga ccctggagga ggggaggaag 2160  
 10 cggggctacg tggaaaccct cttcggaaga aggcgctacg tgcccgcact caacgcccgg 2220  
 gtgaagagcg tcagggaggg cgcgagcgcg atggccttca acatgcccgt ccagggcacc 2280  
 gccgccgacc tcatgaagct cgccatggtg aagctcttcc cccgcctccg ggagatgggg 2340  
 15 gcccgcatgc tcctccaggt cgccaacgag ctctctctgg aggcccccca agcgcggggcc 2400  
 gaggaggtgg cggttttggc caaggaggcc atggagaagg cctatcccct cgccgtgccc 2460  
 20 ctggaggtgg aggtggggat gggggaggac tggctttccg ccaagggtca ccaccaccac 2520  
 caccac 2526

20 <210> 23

<211> 842

<212> PRT

25 <213> *Thermus thermophilus*

<400> 23

30 Met Asn Ser Glu Ala Met Leu Pro Leu Phe Glu Pro Lys Gly Arg Val  
     1                    5                    10                    15  
 Leu Leu Val Asp Gly His His Leu Ala Tyr Arg Thr Phe Phe Ala Leu  
                     20                    25                    30  
 35 Lys Gly Leu Thr Thr Ser Arg Gly Glu Pro Val Gln Ala Val Tyr Gly  
                     35                    40                    45  
 40 Phe Ala Lys Ser Leu Leu Lys Ala Leu Lys Glu Asp Gly Tyr Lys Ala  
                     50                    55                    60  
 Val Phe Val Val Phe Asp Ala Lys Ala Pro Ser Phe Arg His Glu Ala  
                     65                    70                    75                    80  
 45 Tyr Glu Ala Tyr Lys Ala Gly Arg Ala Pro Thr Pro Glu Asp Phe Pro  
                     85                    90                    95  
 Arg Gln Leu Ala Leu Ile Lys Glu Leu Val Asp Leu Leu Gly Phe Thr  
                     100                    105                    110  
 50 Arg Leu Glu Val Pro Gly Tyr Glu Ala Asp Asp Val Leu Ala Thr Leu  
                     115                    120                    125  
 55 Ala Lys Lys Ala Glu Lys Glu Gly Tyr Glu Val Arg Ile Leu Thr Ala  
                     130                    135                    140  
 Asp Arg Asp Leu Tyr Gln Leu Val Ser Asp Arg Val Ala Val Leu His  
                     145                    150                    155                    160  
 60 Pro Glu Gly His Leu Ile Thr Pro Glu Trp Leu Trp Glu Lys Tyr Gly  
                     165                    170                    175

|    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
|    | Leu | Arg | Pro | Glu | Gln | Trp | Val | Asp | Phe | Arg | Ala | Leu | Val | Gly | Asp | Pro |  |
|    |     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |  |
| 5  | Ser | Asp | Asn | Leu | Pro | Gly | Val | Lys | Gly | Ile | Gly | Glu | Lys | Thr | Ala | Leu |  |
|    |     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |  |
|    | Lys | Leu | Leu | Lys | Glu | Trp | Gly | Ser | Leu | Glu | Asn | Leu | Leu | Lys | Asn | Leu |  |
|    |     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |  |
| 10 | Asp | Arg | Val | Lys | Pro | Glu | Asn | Val | Arg | Glu | Lys | Ile | Lys | Ala | His | Leu |  |
|    |     |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |  |
|    | Glu | Asp | Leu | Arg | Leu | Ser | Leu | Glu | Leu | Ser | Arg | Val | Arg | Thr | Asp | Leu |  |
|    |     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |  |
| 15 | Pro | Leu | Glu | Val | Asp | Leu | Ala | Gln | Gly | Arg | Glu | Pro | Asp | Arg | Glu | Gly |  |
|    |     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |  |
|    | Leu | Arg | Ala | Phe | Leu | Glu | Arg | Leu | Glu | Phe | Gly | Ser | Leu | Leu | His | Glu |  |
| 20 |     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |  |
|    | Phe | Gly | Leu | Leu | Glu | Ala | Pro | Ala | Pro | Leu | Glu | Glu | Ala | Pro | Trp | Pro |  |
|    |     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |  |
| 25 | Pro | Pro | Glu | Gly | Ala | Phe | Val | Gly | Phe | Val | Leu | Ser | Arg | Pro | Glu | Pro |  |
|    |     |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |  |
|    | Met | Trp | Ala | Glu | Leu | Lys | Ala | Leu | Ala | Ala | Cys | Arg | Gly | Gly | Arg | Val |  |
|    |     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |  |
| 30 | His | Arg | Ala | Ala | Asp | Pro | Leu | Ala | Gly | Leu | Lys | Asp | Leu | Lys | Glu | Val |  |
|    |     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |  |
|    | Arg | Gly | Leu | Leu | Ala | Lys | Asp | Leu | Ala | Val | Leu | Ala | Ser | Arg | Glu | Gly |  |
| 35 |     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |  |
|    | Leu | Asp | Leu | Val | Pro | Gly | Asp | Asp | Pro | Met | Leu | Leu | Ala | Tyr | Leu | Leu |  |
|    |     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |  |
| 40 | Asp | Pro | Ser | Asn | Thr | Thr | Pro | Glu | Gly | Val | Ala | Arg | Arg | Tyr | Gly | Gly |  |
|    |     |     |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |  |
|    | Glu | Trp | Thr | Glu | Asp | Ala | Ala | His | Arg | Ala | Leu | Leu | Ser | Glu | Arg | Leu |  |
|    |     |     |     |     | 405 |     |     |     |     | 410 |     |     |     |     | 415 |     |  |
| 45 | His | Arg | Asn | Leu | Leu | Lys | Arg | Leu | Glu | Gly | Glu | Glu | Lys | Leu | Leu | Trp |  |
|    |     |     |     | 420 |     |     |     |     | 425 |     |     |     |     | 430 |     |     |  |
|    | Leu | Tyr | His | Glu | Val | Glu | Lys | Pro | Leu | Ser | Arg | Val | Leu | Ala | His | Met |  |
| 50 |     |     | 435 |     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |  |
|    | Glu | Ala | Thr | Gly | Val | Arg | Arg | Asp | Val | Ala | Tyr | Leu | Gln | Ala | Leu | Ser |  |
|    |     |     |     |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |  |
| 55 | Leu | Glu | Leu | Ala | Glu | Glu | Ile | Arg | Arg | Leu | Glu | Glu | Glu | Val | Phe | Arg |  |
|    |     |     |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |  |
|    | Leu | Ala | Gly | His | Pro | Phe | Asn | Leu | Asn | Ser | Arg | Asp | Gln | Leu | Glu | Arg |  |
|    |     |     |     |     | 485 |     |     |     |     | 490 |     |     |     |     | 495 |     |  |
| 60 | Val | Leu | Phe | Asp | Glu | Leu | Arg | Leu | Pro | Ala | Leu | Gly | Lys | Thr | Gln | Lys |  |
|    |     |     |     | 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |  |

Thr Gly Lys Arg Ser Thr Ser Ala Ala Val Leu Glu Ala Leu Arg Glu  
 515 520 525  
 5 Ala His Pro Ile Val Glu Lys Ile Leu Gln His Arg Glu Leu Thr Lys  
 530 535 540  
 Leu Lys Asn Thr Tyr Val Asp Pro Leu Pro Ser Leu Val His Pro Arg  
 545 550 555 560  
 10 Thr Gly Arg Leu His Thr Arg Phe Asn Gln Thr Ala Thr Ala Thr Gly  
 565 570 575  
 Arg Leu Ser Ser Ser Asp Pro Asn Leu Gln Asn Ile Pro Val Arg Thr  
 580 585 590  
 15 Pro Leu Gly Gln Arg Ile Arg Arg Ala Phe Val Ala Glu Ala Gly Trp  
 595 600 605  
 20 Ala Leu Val Ala Leu Asp Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala  
 610 615 620  
 His Leu Ser Gly Asp Glu Asn Leu Ile Arg Val Phe Gln Glu Gly Lys  
 625 630 635 640  
 25 Asp Ile His Thr Gln Thr Ala Ser Trp Met Phe Gly Val Pro Pro Glu  
 645 650 655  
 Ala Val Asp Pro Leu Met Arg Arg Ala Ala Lys Thr Val Asn Phe Gly  
 660 665 670  
 30 Val Leu Tyr Gly Met Ser Ala His Arg Leu Ser Gln Glu Leu Ala Ile  
 675 680 685  
 Pro Tyr Glu Glu Ala Val Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe  
 690 695 700  
 35 Pro Lys Val Arg Ala Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Lys  
 705 710 715 720  
 40 Arg Gly Tyr Val Glu Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp  
 725 730 735  
 Leu Asn Ala Arg Val Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala  
 740 745 750  
 45 Phe Asn Met Pro Val Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala  
 755 760 765  
 50 Met Val Lys Leu Phe Pro Arg Leu Arg Glu Met Gly Ala Arg Met Leu  
 770 775 780  
 Leu Gln Val Ala Asn Glu Leu Leu Leu Glu Ala Pro Gln Ala Arg Ala  
 785 790 795 800  
 55 Glu Glu Val Ala Ala Leu Ala Lys Glu Ala Met Glu Lys Ala Tyr Pro  
 805 810 815  
 Leu Ala Val Pro Leu Glu Val Glu Val Gly Met Gly Glu Asp Trp Leu  
 820 825 830  
 60 Ser Ala Lys Gly His His His His His His  
 835 840



|    |            |                      |  |
|----|------------|----------------------|--|
|    | <210>      | 24                   |  |
|    | <211>      | 30                   |  |
| 5  | <212>      | DNA                  |  |
|    | <213>      | synthetic            |  |
| 10 | <400>      | 24                   |  |
|    | caggaggagc | tcgttggcga           | cctggaggag 30                                    |
| 15 | <210>      | 25                   |  |
|    | <211>      | 2526                 |  |
|    | <212>      | DNA                  |  |
| 20 | <213>      | Thermus thermophilus |  |
|    | <400>      | 25                   |  |
| 25 | atgaattccg | aggcgatgct           | tccgctcttt gaacccaaag gccgggtcct cctggtggac 60   |
|    | ggccaccacc | tggcctaccg           | caccttcttc gccctgaagg gcctcaccac gagccggggc 120  |
|    | gaaccggtgc | aggcggtcta           | cggcttcgcc aagagcctcc tcaaggccct gaaggaggac 180  |
| 30 | gggtacaagg | ccgtcttcgt           | ggtctttgac gccaaggccc cctccttcgg ccacgaggcc 240  |
|    | tacgaggcct | acaaggcggg           | gagggccccc acccccaggg acttcccccg gcagctcgcc 300  |
| 35 | ctcatcaagg | agctggtgga           | cctcctgggg tttaccggcc tcgagggtccc cggctacgag 360 |
|    | gcgagacgac | gtctcgccac           | cctggccaag aaggcggaag aggaggggta cgaggtgcgc 420  |
|    | atcctcaccg | ccgaccgcga           | cctctaccaa ctcgtctccg accgcgtcgc cgtcctccac 480  |
| 40 | cccagaggcc | acctcatcac           | cccggagtgg ctttgggaga agtacggcct caggccggag 540  |
|    | cagtgggtgg | acttccgcgc           | cctcgtgggg gacccctccg acaacctccc cgggggtcaag 600 |
| 45 | ggcatcgggg | agaagaccgc           | cctcaagctc ctcaaggagt ggggaagcct ggaaaacctc 660  |
|    | ctcaagaacc | tggaccgggt           | aaagccagaa aacgtccggg agaagatcaa ggcccacctg 720  |
|    | gaagacctca | ggctctcctt           | ggagctctcc cgggtgcgca ccgacctccc cctggagggtg 780 |
| 50 | gacctcgccc | aggggcggga           | gcccgaccgg gaggggctta gggccttcct ggagaggctg 840  |
|    | gagttcggca | gcctcctcca           | cgagttcggc ctcttgaggg cccccgcccc cctggaggag 900  |
| 55 | gccccctggc | ccccgcggga           | aggggccttc gtgggcttcg tcctctcccc ccccagagccc 960 |
|    | atgtggggcg | agcttaaagc           | cctggccgcc tgcaggggag gccgcgtgca ccgggcagca 1020 |
|    | gaccccttgg | cggggctaaa           | ggacctcaag gaggtccggg gcctcctcgc caaggacctc 1080 |
| 60 | gccgtcttgg | cctcgaggga           | ggggctagac ctcgtgcccc gggacgaccc catgctcctc 1140 |

|    |  |      |
|----|--|------|
|    | gcctacctcc tggacccttc gaacaccacc cccgaggggg tggcgcggcg ctacgggggg  | 1200 |
|    | gagtggacgg aggacgcgc ccaccgggcc ctctctctcg agaggctcca tcggaacctc   | 1260 |
| 5  | cttaagcgcc tcgaggggga ggagaagctc ctttggtctt accacgaggt ggaaaagccc  | 1320 |
|    | ctctcccggg tcctggccca tatggaggcc accgggggtac ggcgggacgt ggcctacctt | 1380 |
| 10 | caggcccttt ccctggagct tgcggaggag atccgccgcc tcgaggagga ggtcttccgc  | 1440 |
|    | ttggcgggcc accccttcaa cctcaactcc cgggaccagc tggaaagggg gctctttgac  | 1500 |
|    | gagcttaggc ttccgcctt gaagaagacg aagaagacag gcaagcgctc caccagcgcc   | 1560 |
| 15 | gcggtgctgg aggccctacg ggaggccac cccatcgtgg agaagatcct ccagcaccgg   | 1620 |
|    | gagctcacca agctcaagaa cacctacgtg gacccctcc caagcctcgt ccacccgagg   | 1680 |
|    | acgggcccgc tccacaccg cttcaaccag acggccacgg ccacggggag gcttagtagc   | 1740 |
| 20 | tccgacccca acctgcagaa catccccgtc cgcacccct tgggccagag gatccgccgg   | 1800 |
|    | gccttcgtgg ccgaggcggg ttgggcgttg gtggccctgg actatagcca gatagagctc  | 1860 |
| 25 | cgcgtcctcg cccacctctc cggggacgaa aacctgatca gggctttcca ggaggggaag  | 1920 |
|    | gacatccaca cccagaccgc aagctggatg ttcggcgctc ccccgaggc cgtggacccc   | 1980 |
|    | ctgatgcgcc gggcggccaa gacggtgaac ttcggcgctc tctacggcat gtccgcccac  | 2040 |
| 30 | aggctctccc aggagcttgc catcccctac gaggaggcgg tggcctttat agagcgctac  | 2100 |
|    | ttccaaagct tccccaaggt gcgggcctgg atagaaaaga ccctggagga ggggaggaag  | 2160 |
| 35 | cggggctacg tggaaaccct cttcggaaga aggcgctacg tgcccacct caacgcccgg   | 2220 |
|    | gtgaagagcg tcagggaggc gcgagcgcg atggccttca acatgcccgt ccagggcacc   | 2280 |
| 40 | gccgccgacc tcatgaagct cgccatggtg aagctcttcc cccgcctccg ggagatgggg  | 2340 |
|    | gcccgcagtc tcctccaggt cgccaacgag ctctctctgg agggccccc agcgcggggc   | 2400 |
|    | gaggaggtgg cggctttggc caaggaggcc atggagaagg cctatcccct cgccgtgccc  | 2460 |
| 45 | ctggaggtgg aggtggggat gggggaggac tggttttccg ccaagggta ccaccaccac   | 2520 |
|    | caccac   | 2526 |
| 50 | <210> 26   |      |
|    | <211> 842  |      |
|    | <212> PRT  |      |
| 55 | <213> Thermus thermophilus   |      |
|    | <400> 26   |      |
| 60 | Met Asn Ser Glu Ala Met Leu Pro Leu Phe Glu Pro Lys Gly Arg Val    |      |
|    | 1 5 10 15  |      |

|    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
|    | Leu | Leu | Val | Asp | Gly | His | His | Leu | Ala | Tyr | Arg | Thr | Phe | Phe | Ala | Leu |  |
|    |     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |  |
| 5  | Lys | Gly | Leu | Thr | Thr | Ser | Arg | Gly | Glu | Pro | Val | Gln | Ala | Val | Tyr | Gly |  |
|    |     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |  |
|    | Phe | Ala | Lys | Ser | Leu | Leu | Lys | Ala | Leu | Lys | Glu | Asp | Gly | Tyr | Lys | Ala |  |
|    |     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |  |
| 10 | Val | Phe | Val | Val | Phe | Asp | Ala | Lys | Ala | Pro | Ser | Phe | Arg | His | Glu | Ala |  |
|    |     | 65  |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |  |
|    | Tyr | Glu | Ala | Tyr | Lys | Ala | Gly | Arg | Ala | Pro | Thr | Pro | Glu | Asp | Phe | Pro |  |
|    |     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |  |
| 15 | Arg | Gln | Leu | Ala | Leu | Ile | Lys | Glu | Leu | Val | Asp | Leu | Leu | Gly | Phe | Thr |  |
|    |     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |  |
|    | Arg | Leu | Glu | Val | Pro | Gly | Tyr | Glu | Ala | Asp | Asp | Val | Leu | Ala | Thr | Leu |  |
| 20 |     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |  |
|    | Ala | Lys | Lys | Ala | Glu | Lys | Glu | Gly | Tyr | Glu | Val | Arg | Ile | Leu | Thr | Ala |  |
|    |     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |  |
| 25 | Asp | Arg | Asp | Leu | Tyr | Gln | Leu | Val | Ser | Asp | Arg | Val | Ala | Val | Leu | His |  |
|    |     | 145 |     |     |     | 150 |     |     |     | 155 |     |     |     |     |     | 160 |  |
|    | Pro | Glu | Gly | His | Leu | Ile | Thr | Pro | Glu | Trp | Leu | Trp | Glu | Lys | Tyr | Gly |  |
|    |     |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |  |
| 30 | Leu | Arg | Pro | Glu | Gln | Trp | Val | Asp | Phe | Arg | Ala | Leu | Val | Gly | Asp | Pro |  |
|    |     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |  |
|    | Ser | Asp | Asn | Leu | Pro | Gly | Val | Lys | Gly | Ile | Gly | Glu | Lys | Thr | Ala | Leu |  |
| 35 |     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |  |
|    | Lys | Leu | Leu | Lys | Glu | Trp | Gly | Ser | Leu | Glu | Asn | Leu | Leu | Lys | Asn | Leu |  |
|    |     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |  |
| 40 | Asp | Arg | Val | Lys | Pro | Glu | Asn | Val | Arg | Glu | Lys | Ile | Lys | Ala | His | Leu |  |
|    |     | 225 |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |  |
|    | Glu | Asp | Leu | Arg | Leu | Ser | Leu | Glu | Leu | Ser | Arg | Val | Arg | Thr | Asp | Leu |  |
|    |     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |  |
| 45 | Pro | Leu | Glu | Val | Asp | Leu | Ala | Gln | Gly | Arg | Glu | Pro | Asp | Arg | Glu | Gly |  |
|    |     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |  |
|    | Leu | Arg | Ala | Phe | Leu | Glu | Arg | Leu | Glu | Phe | Gly | Ser | Leu | Leu | His | Glu |  |
| 50 |     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |  |
|    | Phe | Gly | Leu | Leu | Glu | Ala | Pro | Ala | Pro | Leu | Glu | Glu | Ala | Pro | Trp | Pro |  |
|    |     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |  |
| 55 | Pro | Pro | Glu | Gly | Ala | Phe | Val | Gly | Phe | Val | Leu | Ser | Arg | Pro | Glu | Pro |  |
|    |     | 305 |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |  |
|    | Met | Trp | Ala | Glu | Leu | Lys | Ala | Leu | Ala | Ala | Cys | Arg | Gly | Gly | Arg | Val |  |
|    |     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |  |
| 60 | His | Arg | Ala | Ala | Asp | Pro | Leu | Ala | Gly | Leu | Lys | Asp | Leu | Lys | Glu | Val |  |
|    |     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |  |

|    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
|    | Arg | Gly | Leu | Leu | Ala | Lys | Asp | Leu | Ala | Val | Leu | Ala | Ser | Arg | Glu | Gly |  |
|    |     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |  |
| 5  | Leu | Asp | Leu | Val | Pro | Gly | Asp | Asp | Pro | Met | Leu | Leu | Ala | Tyr | Leu | Leu |  |
|    |     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |  |
|    | Asp | Pro | Ser | Asn | Thr | Thr | Pro | Glu | Gly | Val | Ala | Arg | Arg | Tyr | Gly | Gly |  |
|    |     | 385 |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |  |
| 10 | Glu | Trp | Thr | Glu | Asp | Ala | Ala | His | Arg | Ala | Leu | Leu | Ser | Glu | Arg | Leu |  |
|    |     |     |     |     | 405 |     |     |     |     | 410 |     |     |     |     | 415 |     |  |
|    | His | Arg | Asn | Leu | Leu | Lys | Arg | Leu | Glu | Gly | Glu | Glu | Lys | Leu | Leu | Trp |  |
|    |     |     | 420 |     |     |     |     |     | 425 |     |     |     |     | 430 |     |     |  |
| 15 | Leu | Tyr | His | Glu | Val | Glu | Lys | Pro | Leu | Ser | Arg | Val | Leu | Ala | His | Met |  |
|    |     |     | 435 |     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |  |
|    | Glu | Ala | Thr | Gly | Val | Arg | Arg | Asp | Val | Ala | Tyr | Leu | Gln | Ala | Leu | Ser |  |
| 20 |     | 450 |     |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |  |
|    | Leu | Glu | Leu | Ala | Glu | Glu | Ile | Arg | Arg | Leu | Glu | Glu | Glu | Val | Phe | Arg |  |
|    |     | 465 |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |  |
| 25 | Leu | Ala | Gly | His | Pro | Phe | Asn | Leu | Asn | Ser | Arg | Asp | Gln | Leu | Glu | Arg |  |
|    |     |     |     |     | 485 |     |     |     |     | 490 |     |     |     |     | 495 |     |  |
|    | Val | Leu | Phe | Asp | Glu | Leu | Arg | Leu | Pro | Ala | Leu | Lys | Lys | Thr | Lys | Lys |  |
|    |     |     |     | 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |  |
| 30 | Thr | Gly | Lys | Arg | Ser | Thr | Ser | Ala | Ala | Val | Leu | Glu | Ala | Leu | Arg | Glu |  |
|    |     |     | 515 |     |     |     |     | 520 |     |     |     |     | 525 |     |     |     |  |
|    | Ala | His | Pro | Ile | Val | Glu | Lys | Ile | Leu | Gln | His | Arg | Glu | Leu | Thr | Lys |  |
| 35 |     | 530 |     |     |     |     | 535 |     |     |     |     | 540 |     |     |     |     |  |
|    | Leu | Lys | Asn | Thr | Tyr | Val | Asp | Pro | Leu | Pro | Ser | Leu | Val | His | Pro | Arg |  |
|    |     | 545 |     |     |     | 550 |     |     |     |     | 555 |     |     |     |     | 560 |  |
| 40 | Thr | Gly | Arg | Leu | His | Thr | Arg | Phe | Asn | Gln | Thr | Ala | Thr | Ala | Thr | Gly |  |
|    |     |     |     |     | 565 |     |     |     |     | 570 |     |     |     |     | 575 |     |  |
|    | Arg | Leu | Ser | Ser | Ser | Asp | Pro | Asn | Leu | Gln | Asn | Ile | Pro | Val | Arg | Thr |  |
|    |     |     |     | 580 |     |     |     |     | 585 |     |     |     |     | 590 |     |     |  |
| 45 | Pro | Leu | Gly | Gln | Arg | Ile | Arg | Arg | Ala | Phe | Val | Ala | Glu | Ala | Gly | Trp |  |
|    |     |     | 595 |     |     |     |     | 600 |     |     |     |     | 605 |     |     |     |  |
|    | Ala | Leu | Val | Ala | Leu | Asp | Tyr | Ser | Gln | Ile | Glu | Leu | Arg | Val | Leu | Ala |  |
| 50 |     | 610 |     |     |     |     | 615 |     |     |     |     | 620 |     |     |     |     |  |
|    | His | Leu | Ser | Gly | Asp | Glu | Asn | Leu | Ile | Arg | Val | Phe | Gln | Glu | Gly | Lys |  |
|    |     | 625 |     |     |     | 630 |     |     |     |     | 635 |     |     |     |     | 640 |  |
| 55 | Asp | Ile | His | Thr | Gln | Thr | Ala | Ser | Trp | Met | Phe | Gly | Val | Pro | Pro | Glu |  |
|    |     |     |     |     | 645 |     |     |     |     | 650 |     |     |     |     | 655 |     |  |
|    | Ala | Val | Asp | Pro | Leu | Met | Arg | Arg | Ala | Ala | Lys | Thr | Val | Asn | Phe | Gly |  |
|    |     |     |     | 660 |     |     |     |     | 665 |     |     |     |     | 670 |     |     |  |
| 60 | Val | Leu | Tyr | Gly | Met | Ser | Ala | His | Arg | Leu | Ser | Gln | Glu | Leu | Ala | Ile |  |
|    |     |     | 675 |     |     |     |     | 680 |     |     |     |     | 685 |     |     |     |  |

Pro Tyr Glu Glu Ala Val Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe  
 690 695 700  
 5 Pro Lys Val Arg Ala Trp Ile Glu Lys Thr Leu Glu Glu Gly Arg Lys  
 705 710 715 720  
 Arg Gly Tyr Val Glu Thr Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp  
 725 730 735  
 10 Leu Asn Ala Arg Val Lys Ser Val Arg Glu Ala Ala Glu Arg Met Ala  
 740 745 750  
 Phe Asn Met Pro Val Gln Gly Thr Ala Ala Asp Leu Met Lys Leu Ala  
 755 760 765  
 15 Met Val Lys Leu Phe Pro Arg Leu Arg Glu Met Gly Ala Arg Met Leu  
 770 775 780  
 20 Leu Gln Val Ala Asn Glu Leu Leu Leu Glu Ala Pro Gln Ala Arg Ala  
 785 790 795 800  
 Glu Glu Val Ala Ala Leu Ala Lys Glu Ala Met Glu Lys Ala Tyr Pro  
 805 810 815  
 25 Leu Ala Val Pro Leu Glu Val Glu Val Gly Met Gly Glu Asp Trp Leu  
 820 825 830  
 Ser Ala Lys Gly His His His His His His  
 835 840  
 30  
 <210> 27  
 <211> 340  
 35 <212> PRT  
 <213> Pyrococcus furiosus  
 40 <400> 27  
 Met Gly Val Pro Ile Gly Glu Ile Ile Pro Arg Lys Glu Ile Glu Leu  
 1 5 10 15  
 45 Glu Asn Leu Tyr Gly Lys Lys Ile Ala Ile Asp Ala Leu Asn Ala Ile  
 20 25 30  
 Tyr Gln Phe Leu Ser Thr Ile Arg Gln Lys Asp Gly Thr Pro Leu Met  
 35 40 45  
 50 Asp Ser Lys Gly Arg Ile Thr Ser His Leu Ser Gly Leu Phe Tyr Arg  
 50 55 60  
 Thr Ile Asn Leu Met Glu Ala Gly Ile Lys Pro Val Tyr Val Phe Asp  
 65 70 75 80  
 55 Gly Glu Pro Pro Glu Phe Lys Lys Lys Glu Leu Glu Lys Arg Arg Glu  
 85 90 95  
 60 Ala Arg Glu Glu Ala Glu Glu Lys Trp Arg Glu Ala Leu Glu Lys Gly  
 100 105 110

|    |       |     |                          |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|----|-------|-----|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
|    | Glu   | Ile | Glu                      | Glu | Ala | Arg | Lys | Tyr | Ala | Gln | Arg | Ala | Thr | Arg | Val | Asn |  |
|    |       |     | 115                      |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |  |
| 5  | Glu   | Met | Leu                      | Ile | Glu | Asp | Ala | Lys | Lys | Leu | Leu | Glu | Leu | Met | Gly | Ile |  |
|    |       | 130 |                          |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |  |
|    | Pro   | Ile | Val                      | Gln | Ala | Pro | Ser | Glu | Gly | Glu | Ala | Gln | Ala | Ala | Tyr | Met |  |
|    |       | 145 |                          |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |  |
| 10 | Ala   | Ala | Lys                      | Gly | Ser | Val | Tyr | Ala | Ser | Ala | Ser | Gln | Asp | Tyr | Asp | Ser |  |
|    |       |     |                          |     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |  |
|    | Leu   | Leu | Phe                      | Gly | Ala | Pro | Arg | Leu | Val | Arg | Asn | Leu | Thr | Ile | Thr | Gly |  |
|    |       |     |                          | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |  |
| 15 | Lys   | Arg | Lys                      | Leu | Pro | Gly | Lys | Asn | Val | Tyr | Val | Glu | Ile | Lys | Pro | Glu |  |
|    |       |     | 195                      |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |  |
|    | Leu   | Ile | Ile                      | Leu | Glu | Glu | Val | Leu | Lys | Glu | Leu | Lys | Leu | Thr | Arg | Glu |  |
| 20 |       | 210 |                          |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |  |
|    | Lys   | Leu | Ile                      | Glu | Leu | Ala | Ile | Leu | Val | Gly | Thr | Asp | Tyr | Asn | Pro | Gly |  |
|    |       | 225 |                          |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |  |
| 25 | Gly   | Ile | Lys                      | Gly | Ile | Gly | Leu | Lys | Lys | Ala | Leu | Glu | Ile | Val | Arg | His |  |
|    |       |     |                          |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |  |
|    | Ser   | Lys | Asp                      | Pro | Leu | Ala | Lys | Phe | Gln | Lys | Gln | Ser | Asp | Val | Asp | Leu |  |
|    |       |     |                          | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |  |
| 30 | Tyr   | Ala | Ile                      | Lys | Glu | Phe | Phe | Leu | Asn | Pro | Pro | Val | Thr | Asp | Asn | Tyr |  |
|    |       |     | 275                      |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |  |
|    | Asn   | Leu | Val                      | Trp | Arg | Asp | Pro | Asp | Glu | Glu | Gly | Ile | Leu | Lys | Phe | Leu |  |
| 35 |       | 290 |                          |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |  |
|    | Cys   | Asp | Glu                      | His | Asp | Phe | Ser | Glu | Glu | Arg | Val | Lys | Asn | Gly | Leu | Glu |  |
|    |       | 305 |                          |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |  |
| 40 | Arg   | Leu | Lys                      | Lys | Ala | Ile | Lys | Ser | Gly | Lys | Gln | Ser | Thr | Leu | Glu | Ser |  |
|    |       |     |                          |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |  |
|    | Trp   | Phe | Lys                      | Arg |     |     |     |     |     |     |     |     |     |     |     |     |  |
|    |       |     |                          | 340 |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 45 | <210> |     | 28                       |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|    | <211> |     | 326                      |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|    | <212> |     | PRT                      |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 50 | <213> |     | Methanococcus jannaschii |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|    | <400> |     | 28                       |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 55 | Met   | Gly | Val                      | Gln | Phe | Gly | Asp | Phe | Ile | Pro | Lys | Asn | Ile | Ile | Ser | Phe |  |
|    |       | 1   |                          |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |  |
|    | Glu   | Asp | Leu                      | Lys | Gly | Lys | Lys | Val | Ala | Ile | Asp | Gly | Met | Asn | Ala | Leu |  |
|    |       |     |                          | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |  |
| 60 | Tyr   | Gln | Phe                      | Leu | Thr | Ser | Ile | Arg | Leu | Arg | Asp | Gly | Ser | Pro | Leu | Arg |  |
|    |       |     | 35                       |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |  |

|    |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
|----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
|    | Asn  | Arg | Lys | Gly | Glu | Ile | Thr | Ser | Ala | Tyr | Asn | Gly | Val | Phe | Tyr | Lys |    |
|    | 50   |     |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |    |
| 5  | Thr  | Ile | His | Leu | Leu | Glu | Asn | Asp | Ile | Thr | Pro | Ile | Trp | Val | Phe | Asp | 80 |
|    | 65   |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     |     |    |
|    | Gly  | Glu | Pro | Pro | Lys | Leu | Lys | Glu | Lys | Thr | Arg | Lys | Val | Arg | Arg | Glu |    |
|    |  |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |    |
| 10 | Met  | Lys | Glu | Lys | Ala | Glu | Leu | Lys | Met | Lys | Glu | Ala | Ile | Lys | Lys | Glu |    |
|    |  |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |    |
|    | Asp  | Phe | Glu | Glu | Ala | Ala | Lys | Tyr | Ala | Lys | Arg | Val | Ser | Tyr | Leu | Thr |    |
|    |  |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |    |
| 15 | Pro  | Lys | Met | Val | Glu | Asn | Cys | Lys | Tyr | Leu | Leu | Ser | Leu | Met | Gly | Ile |    |
|    |  | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |    |
| 20 | Pro  | Tyr | Val | Glu | Ala | Pro | Ser | Glu | Gly | Glu | Ala | Gln | Ala | Ser | Tyr | Met |    |
|    | 145  |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |    |
|    | Ala  | Lys | Lys | Gly | Asp | Val | Trp | Ala | Val | Val | Ser | Gln | Asp | Tyr | Asp | Ala |    |
|    |  |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |    |
| 25 | Leu  | Leu | Tyr | Gly | Ala | Pro | Arg | Val | Val | Arg | Asn | Leu | Thr | Thr | Thr | Lys |    |
|    |  |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |    |
|    | Glu  | Met | Pro | Glu | Leu | Ile | Glu | Leu | Asn | Glu | Val | Leu | Glu | Asp | Leu | Arg |    |
|    |  |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |    |
| 30 | Ile  | Ser | Leu | Asp | Asp | Leu | Ile | Asp | Ile | Ala | Ile | Phe | Met | Gly | Thr | Asp |    |
|    |  | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |    |
|    | Tyr  | Asn | Pro | Gly | Gly | Val | Lys | Gly | Ile | Gly | Phe | Lys | Arg | Ala | Tyr | Glu |    |
| 35 |  |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |    |
|    | Leu  | Val | Arg | Ser | Gly | Val | Ala | Lys | Asp | Val | Leu | Lys | Lys | Glu | Val | Glu |    |
|    |  |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |    |
| 40 | Tyr  | Tyr | Asp | Glu | Ile | Lys | Arg | Ile | Phe | Lys | Glu | Pro | Lys | Val | Thr | Asp |    |
|    |  |     | 260 |     |     |     |     |     | 265 |     |     |     |     | 270 |     |     |    |
|    | Asn  | Tyr | Ser | Leu | Ser | Leu | Lys | Leu | Pro | Asp | Lys | Glu | Gly | Ile | Ile | Lys |    |
|    |  |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |    |
| 45 | Phe  | Leu | Val | Asp | Glu | Asn | Asp | Phe | Asn | Tyr | Asp | Arg | Val | Lys | Lys | His |    |
|    |  | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |    |
| 50 | Val  | Asp | Lys | Leu | Tyr | Asn | Leu | Ile | Ala | Asn | Lys | Thr | Lys | Gln | Lys | Thr |    |
|    | 305  |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |    |
|    | Leu  | Asp | Ala | Trp | Phe | Lys |     |     |     |     |     |     |     |     |     |     |    |
|    |  |     |     |     | 325 |     |     |     |     |     |     |     |     |     |     |     |    |
| 55 |  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
|    | <210> 29                                   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
|    | <211> 328                                  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
| 60 | <212> PRT                                  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
|    | <213> Methanobacterium thermoautotrophicum |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |

<400> 29

5 Met Gly Val Lys Leu Arg Asp Val Val Ser Pro Arg Arg Ile Arg Leu  
1 5 10 15  
Glu Asp Leu Arg Gly Arg Thr Val Ala Val Asp Ala Ala Asn Thr Leu  
20 25 30  
10 Tyr Gln Phe Leu Ser Ser Ile Arg Gln Arg Asp Gly Thr Pro Leu Met  
35 40 45  
Asp Ser Arg Gly Arg Val Thr Ser His Leu Ser Gly Ile Leu Tyr Arg  
50 55 60  
15 Thr Ala Ala Val Met Glu Arg Glu Ile Arg Val Ile Tyr Val Phe Asp  
65 70 75 80  
Gly Arg Ser His His Leu Lys Gly Glu Thr Val Ser Arg Arg Ala Asp  
85 90 95  
20 Ile Arg Lys Lys Ser Glu Val Glu Trp Lys Arg Ala Leu Glu Glu Gly  
100 105 110  
25 Asp Ile Asp Arg Ala Arg Lys Tyr Ala Val Arg Ser Ser Arg Met Ser  
115 120 125  
Ser Glu Ile Leu Glu Ser Ser Lys Arg Leu Leu Glu Leu Leu Gly Ile  
130 135 140  
30 Pro Tyr Val Gln Ala Pro Gly Glu Gly Glu Ala Gln Ala Ser Tyr Met  
145 150 155 160  
Val Lys Met Gly Asp Ala Trp Ala Val Ala Ser Gln Asp Tyr Asp Cys  
165 170 175  
35 Leu Leu Phe Gly Ala Pro Arg Val Val Arg Lys Val Thr Leu Ser Gly  
180 185 190  
Lys Leu Glu Asp Pro His Ile Ile Glu Leu Glu Ser Thr Leu Arg Ala  
195 200 205  
40 Leu Ser Ile Ser His Thr Gln Leu Val Asp Met Ala Leu Leu Val Gly  
210 215 220  
45 Thr Asp Phe Asn Glu Gly Val Lys Gly Tyr Gly Ala Arg Arg Gly Leu  
225 230 235 240  
Lys Leu Ile Arg Glu Lys Gly Asp Ile Phe Lys Val Ile Arg Asp Leu  
245 250 255  
50 Glu Ala Asp Ile Gly Gly Asp Pro Gln Val Leu Arg Arg Ile Phe Leu  
260 265 270  
Glu Pro Glu Val Ser Glu Asp Tyr Glu Ile Arg Trp Arg Lys Pro Asp  
275 280 285  
55 Val Glu Gly Val Ile Glu Phe Leu Cys Thr Glu His Gly Phe Ser Glu  
290 295 300  
60 Asp Arg Val Arg Asp Ala Leu Lys Lys Phe Glu Gly Ala Ser Ser Thr  
305 310 315 320



Gln Lys Ser Leu Glu Asp Trp Phe  
325

5

<210> 30

<211> 336

10

<212> PRT

<213> Afu

<400> 30

15

Met Gly Ala Asp Ile Gly Asp Leu Phe Glu Arg Glu Glu Val Glu Leu  
1 5 10 15

20

Glu Tyr Phe Ser Gly Lys Lys Ile Ala Val Asp Ala Phe Asn Thr Leu  
20 25 30

Tyr Gln Phe Ile Ser Ile Ile Arg Gln Pro Asp Gly Thr Pro Leu Lys  
35 40 45

25

Asp Ser Gln Gly Arg Ile Thr Ser His Leu Ser Gly Ile Leu Tyr Arg  
50 55 60

30

Val Ser Asn Met Val Glu Val Gly Ile Arg Pro Val Phe Val Phe Asp  
65 70 75 80

Gly Glu Pro Pro Glu Phe Lys Lys Ala Glu Ile Glu Glu Arg Lys Lys  
85 90 95

35

Arg Arg Ala Glu Ala Glu Glu Met Trp Ile Ala Ala Leu Gln Ala Gly  
100 105 110

Asp Lys Asp Ala Lys Lys Tyr Ala Gln Ala Ala Gly Arg Val Asp Glu  
115 120 125

40

Tyr Ile Val Asp Ser Ala Lys Thr Leu Leu Ser Tyr Met Gly Ile Pro  
130 135 140

45

Phe Val Asp Ala Pro Ser Glu Gly Glu Ala Gln Ala Ala Tyr Met Ala  
145 150 155 160

Ala Lys Gly Asp Val Glu Tyr Thr Gly Ser Gln Asp Tyr Asp Ser Leu  
165 170 175

50

Leu Phe Gly Ser Pro Arg Leu Ala Arg Asn Leu Ala Ile Thr Gly Lys  
180 185 190

Arg Lys Leu Pro Gly Lys Asn Val Tyr Val Asp Val Lys Pro Glu Ile  
195 200 205

55

Ile Ile Leu Glu Ser Asn Leu Lys Arg Leu Gly Leu Thr Arg Glu Gln  
210 215 220

60

Leu Ile Asp Ile Ala Ile Leu Val Gly Thr Asp Tyr Asn Glu Gly Val  
225 230 235 240

Lys Gly Val Gly Val Lys Lys Ala Leu Asn Tyr Ile Lys Thr Tyr Gly

|    | 245   | 250 | 255 |
|----|---|-----|-----|
|    | Asp Ile Phe Arg Ala Leu Lys Ala Leu Lys Val Asn Ile Asp His Val |     |     |
|    | 260   | 265 | 270 |
| 5  | Glu Glu Ile Arg Asn Phe Phe Leu Asn Pro Pro Val Thr Asp Asp Tyr |     |     |
|    | 275   | 280 | 285 |
| 10 | Arg Ile Glu Phe Arg Glu Pro Asp Phe Glu Lys Ala Ile Glu Phe Leu |     |     |
|    | 290   | 295 | 300 |
|    | Cys Glu Glu His Asp Phe Ser Arg Glu Arg Val Glu Lys Ala Leu Glu |     |     |
|    | 305   | 310 | 315 |
| 15 | Lys Leu Lys Ala Leu Lys Ser Thr Gln Ala Thr Leu Glu Arg Trp Phe |     |     |
|    | 325   | 330 | 335 |
| 20 | <210> 31  |     |     |
|    | <211> 27  |     |     |
|    | <212> DNA   |     |     |
| 25 | <213> synthetic   |     |     |
|    | <220><221> misc_feature<222> (17)..(18)<223> n = degeneracy     |     |     |
|    | <220><221> misc_feature<222> (27)..(28)<223> n = degeneracy     |     |     |
| 30 | <400> 31  |     |     |
|    | atctctagca ctgctgtntt ygayggn                                   |     | 27  |
| 35 | <210> 32  |     |     |
|    | <211> 31  |     |     |
| 40 | <212> DNA   |     |     |
|    | <213> synthetic   |     |     |
|    | <220><221> misc_feature<222> (21)..(22)<223> n = degeneracy     |     |     |
| 45 | <220><221> misc_feature<222> (27)..(28)<223> n = degeneracy     |     |     |
|    | <400> 32  |     |     |
| 50 | gatctctagc actgctgarg gngargcnca r                              |     | 31  |
|    | <210> 33  |     |     |
| 55 | <211> 28  |     |     |
|    | <212> DNA   |     |     |
|    | <213> synthetic   |     |     |
| 60 | <400> 33  |     |     |

|    |   |    |
|----|---|----|
|    | gatctctagc actgctcarg aytaygay  | 28 |
| 5  | <210> 34<br><211> 31<br><212> DNA   |    |
| 10 | <213> synthetic<br><220><221> misc_feature<222> (19)..(20)<223> n = degeneracy<br><220><221> misc_feature<222> (25)..(26)<223> n = degeneracy |    |
| 15 | <400> 34<br>cttaaggtag gactacytgn gcytcnccyt c  | 31 |
| 20 | <210> 35<br><211> 30  |    |
| 25 | <212> DNA<br><213> synthetic<br><400> 35  |    |
| 30 | ttaaggtagg actacytcrt aytcytgrct  | 30 |
| 35 | <210> 36<br><211> 30<br><212> DNA   |    |
| 40 | <213> synthetic<br><220><221> misc_feature<222> (27)..(28)<223> n = degeneracy<br><400> 36  |    |
| 45 | ttaaggtagg actacytcrt aytcytgnga  | 30 |
| 50 | <210> 37<br><211> 30<br><212> DNA   |    |
| 55 | <213> synthetic<br><220><221> misc_feature<222> (24)..(25)<223> n = degeneracy<br><220><221> misc_feature<222> (27)..(28)<223> n = degeneracy |    |
| 60 | <400> 37  |    |

|    |                                  |    |
|----|----------------------------------|----|
|    | ttaaggtagg actacrttrw artcngtncc | 30 |
| 5  | <210> 38                         |    |
|    | <211> 16                         |    |
|    | <212> DNA                        |    |
| 10 | <213> synthetic                  |    |
|    | <400> 38                         |    |
| 15 | gatctctagc actgct                | 16 |
|    | <210> 39                         |    |
| 20 | <211> 17                         |    |
|    | <212> DNA                        |    |
|    | <213> synthetic                  |    |
| 25 | <400> 39                         |    |
|    | ccttaaggta ggactac               | 17 |
| 30 | <210> 40                         |    |
|    | <211> 27                         |    |
|    | <212> DNA                        |    |
| 35 | <213> synthetic                  |    |
|    | <400> 40                         |    |
| 40 | tatcgcagcg atccacttct cctctgc    | 27 |
|    | <210> 41                         |    |
| 45 | <211> 27                         |    |
|    | <212> DNA                        |    |
|    | <213> synthetic                  |    |
| 50 | <400> 41                         |    |
|    | cttaaacggc aacctgagaa ggcttgg    | 27 |
| 55 | <210> 42                         |    |
|    | <211> 28                         |    |
| 60 | <212> DNA                        |    |
|    | <213> synthetic                  |    |

|    |  |    |
|----|--|----|
|    | <400> 42                                 |    |
|    | ctatctcctt ctgcttgaaa acaggagg           | 28 |
| 5  | <210> 43                                 |    |
|    | <211> 27                                 |    |
| 10 | <212> DNA                                |    |
|    | <213> synthetic                          |    |
|    | <400> 43                                 |    |
| 15 | acaagggaac agctcgtcga tatcgcg            | 27 |
|    | <210> 44                                 |    |
| 20 | <211> 32                                 |    |
|    | <212> DNA                                |    |
| 25 | <213> synthetic                          |    |
|    | <400> 44                                 |    |
| 30 | taacgaattc ggtgcagaca taggcgaact ac      | 32 |
|    | <210> 45                                 |    |
|    | <211> 33                                 |    |
| 35 | <212> DNA                                |    |
|    | <213> synthetic                          |    |
| 40 | <400> 45                                 |    |
|    | cgggtgtcgac tcaggaaaac cacctctcaa gcg    | 33 |
| 45 | <210> 46                                 |    |
|    | <211> 37                                 |    |
|    | <212> DNA                                |    |
| 50 | <213> synthetic                          |    |
|    | <400> 46                                 |    |
| 55 | cacaggaaac agaccatggg tgcagacata ggcgaac | 37 |
|    | <210> 47                                 |    |
| 60 | <211> 1017                               |    |
|    | <212> DNA                                |    |

<213> Ave

<400> 47

5 atgggtgcag acataggcga actactcgag agagaagaag ttgaacttga gtacttctcc 60  
 gggagaaaaa tagctattga tgcttttaac actctttacc agttcatatc tatcataagg 120  
 caacctgacg gcactccttt gaaggattct cagggtagaa tgacctcaca cctctccggc 180  
 10 atcctgtacc gcgtgtcaaa catgatcgag gttggaatga gacccatttt cgttttcgat 240  
 ggtgagcctc ctgttttcaa gcagaaggag atagaggaac gaaaggaaa aagagctgaa 300  
 15 gcagaggaga agtggatcgc tgcgatagag agaggagaga agtacgcaa gaagtacgct 360  
 caggcagcgg cgaggggttga tgaatacatc gtcgagtcgt caaagaagct gcttgagtat 420  
 atgggagttc catgggttca ggcgccgagt gaggggagagg cacaggctgc atacatggca 480  
 20 gcgaagggcg atgtagattt tactggctcg caggattacg actcgcttct cttcggcagc 540  
 ccaaagcttg caagaaatct cgcgattact ggaaagagga agctgcccg aaagaatgtt 600  
 25 tacgttgagg tcaaaccaga gataatagac ttaaaccgca acctgagaag gcttggaata 660  
 acaagggaa acgctcgtcga tatcgcgttg ctcgtgggaa cggactacaa cgaaggagt 720  
 aagggcggtt gggtaagaa ggcctacaag tacataaaaa cctacggaga tgttttcaaa 780  
 30 gctctcaagg ccttaaaggt agagcaggag aacatagagg agataagaaa cttcttcctg 840  
 aacccgcctg ttacgaacaa ctacagcctc cacttcggaa agccagacga tgagaagatt 900  
 35 atcgagttcc tgtgtgaaga gcacgacttt agcaaggata gggtagagaa ggccggttag 960  
 aagctgaaag caggaatgca agcctcgcaa tcaacgcttg agaggtgggtt ttcctga 1017

40 <210> 48

<211> 337

<212> PRT

45 <213> Ave

<400> 48

50 Met Gly Ala Asp Ile Gly Glu Leu Leu Glu Arg Glu Glu Val Glu Leu  
 1 5 10 15  
 Glu Tyr Phe Ser Gly Arg Lys Ile Ala Ile Asp Ala Phe Asn Thr Leu  
 20 25 30  
 55 Tyr Gln Phe Ile Ser Ile Ile Arg Gln Pro Asp Gly Thr Pro Leu Lys  
 35 40 45  
 Asp Ser Gln Gly Arg Met Thr Ser His Leu Ser Gly Ile Leu Tyr Arg  
 50 55 60  
 Val Ser Asn Met Ile Glu Val Gly Met Arg Pro Ile Phe Val Phe Asp

|    | 65    | 70        | 75  | 80  |
|----|-------|-----------|-----|-----|
|    | Gly   | Glu       | Pro | Pro |
|    |       | Val       | Phe | Lys |
|    |       | 85        | Gln | Lys |
|    |       |           | 90  | Glu |
|    |       |           | Ile | Glu |
|    |       |           | Glu | Glu |
|    |       |           | Arg | Lys |
|    |       |           |     | 95  |
| 5  | Arg   | Arg       | Ala | Glu |
|    |       |           | 100 | Ala |
|    |       |           | Glu | Glu |
|    |       |           | Lys | Trp |
|    |       |           | 105 | Ile |
|    |       |           | Ala | Ala |
|    |       |           | Ile | Glu |
|    |       |           |     | 110 |
|    |       |           | Arg | Val |
|    |       |           | Asp | Glu |
| 10 | Glu   | Lys       | Tyr | Ala |
|    |       |           | 115 | Lys |
|    |       |           | Lys | Tyr |
|    |       |           | 120 | Gln |
|    |       |           | Ala | Ala |
|    |       |           | Ala | Arg |
|    |       |           |     | 125 |
|    |       |           | Val | Asp |
|    |       |           | Glu |     |
|    |       |           | Tyr | Met |
|    |       |           | 130 | Gly |
|    |       |           |     | 140 |
|    |       |           | Val | Pro |
| 15 | Trp   | Val       | Gln | Ala |
|    |       |           | 145 | Pro |
|    |       |           | Ser | Glu |
|    |       |           | 150 | Gly |
|    |       |           | Glu | Ala |
|    |       |           | Gln | Ala |
|    |       |           | Ala | Tyr |
|    |       |           | Met | Ala |
|    |       |           |     | 160 |
|    |       |           | Ala | Lys |
|    |       |           | Gly | Asp |
|    |       |           | Val | Asp |
|    |       |           | 165 | Phe |
|    |       |           | Thr | Gly |
|    |       |           |     | 170 |
|    |       |           | Ser | Gln |
|    |       |           | Asp | Tyr |
|    |       |           | Asp | Ser |
|    |       |           |     | 175 |
|    |       |           | Leu |     |
| 20 | Leu   | Phe       | Gly | Ser |
|    |       |           | 180 | Pro |
|    |       |           | Lys | Leu |
|    |       |           | Ala | Arg |
|    |       |           |     | 185 |
|    |       |           | Asn | Leu |
|    |       |           | Ala | Ile |
|    |       |           | Thr | Gly |
|    |       |           |     | 190 |
|    |       |           | Lys | Pro |
|    |       |           | Glu | Ile |
| 25 | Arg   | Lys       | Leu | Pro |
|    |       |           | 195 | Gly |
|    |       |           | Lys | Asn |
|    |       |           |     | 200 |
|    |       |           | Val | Tyr |
|    |       |           | Val | Glu |
|    |       |           | Val | Lys |
|    |       |           |     | 205 |
|    |       |           | Pro | Glu |
|    |       |           | Ile |     |
|    |       |           | Thr | Arg |
|    |       |           | Glu | Gln |
|    |       |           | Ile | Thr |
|    |       |           | 210 | Asp |
|    |       |           | Leu | Asn |
|    |       |           | Gly | Asn |
|    |       |           |     | 215 |
|    |       |           | Leu | Arg |
|    |       |           | Arg | Leu |
|    |       |           | Gly | Ile |
|    |       |           |     | 220 |
|    |       |           | Thr | Arg |
|    |       |           | Glu | Gly |
|    |       |           | Val |     |
|    |       |           |     | 240 |
| 30 | Leu   | Val       | Asp | Ile |
|    |       |           | 225 | Ala |
|    |       |           | Leu | Leu |
|    |       |           |     | 230 |
|    |       |           | Val | Gly |
|    |       |           | Thr | Asp |
|    |       |           |     | 235 |
|    |       |           | Tyr | Asn |
|    |       |           | Glu | Gly |
|    |       |           | Val |     |
|    |       |           |     | 240 |
|    |       |           | Lys | Gly |
|    |       |           | Val | Gly |
|    |       |           | 245 | Val |
|    |       |           | Lys | Lys |
|    |       |           | Ala | Tyr |
|    |       |           |     | 250 |
|    |       |           | Tyr | Ile |
|    |       |           | Lys | Thr |
|    |       |           |     | 255 |
|    |       |           | Tyr | Gly |
| 35 | Asp   | Val       | Phe | Lys |
|    |       |           | 260 | Ala |
|    |       |           | Leu | Lys |
|    |       |           | Ala | Leu |
|    |       |           |     | 265 |
|    |       |           | Lys | Val |
|    |       |           | Glu | Gln |
|    |       |           | Glu | Asn |
|    |       |           |     | 270 |
|    |       |           | Ile |     |
|    |       |           | Thr | Asn |
|    |       |           | Asn | Tyr |
|    |       |           |     | 285 |
|    |       |           | Val | Pro |
|    |       |           | Pro | Pro |
|    |       |           | Val | Thr |
|    |       |           |     | 285 |
|    |       |           | Ile | Ile |
|    |       |           | Glu | Phe |
|    |       |           | Leu |     |
|    |       |           |     | 300 |
|    |       |           | Ile |     |
|    |       |           | 300 |     |
|    |       |           | Lys |     |
|    |       |           | Glu |     |
|    |       |           | Val |     |
|    |       |           |     | 315 |
|    |       |           | Arg | Asp |
|    |       |           | Lys | Ser |
|    |       |           | Phe | Asp |
|    |       |           |     | 310 |
|    |       |           | His | Glu |
|    |       |           | Glu | Cys |
|    |       |           |     | 305 |
|    |       |           | Lys | Leu |
|    |       |           | Ala | Gly |
|    |       |           |     | 325 |
|    |       |           | Met | Gln |
|    |       |           | Ala | Ser |
|    |       |           |     | 330 |
|    |       |           | Thr | Leu |
|    |       |           | Glu | Arg |
|    |       |           |     | 335 |
|    |       |           | Trp |     |
| 50 | Phe   | Ser       |     |     |
|    |       |           |     |     |
| 55 | <210> | 49        |     |     |
|    | <211> | 53        |     |     |
|    | <212> | DNA       |     |     |
| 60 | <213> | synthetic |     |     |
|    | <400> | 49        |     |     |

```

cccgctctcgc tggtgaaaag aaaaaccacc ctggcgccca atacgcaaac cgc
53

5  <210> 50
   <211> 26
   <212> DNA
10 <213> synthetic
   <220><221> misc_feature<222> (22)..(23)<223> misc. feature
   <220><221> misc_feature<222> (1)..(2)<223> misc. feature
15 <220><221> misc_feature<222> (2)..(3)<223> misc. feature
   <400> 50
20 tntnccagag cctaatttgc cagtna
   <210> 51
25 <211> 26
   <212> DNA
   <213> synthetic
30 <220><221> misc_feature<222> (1)..(2)<223> misc. feature
   <220><221> misc_feature<222> (2)..(3)<223> Misc. Feature
35 <220><221> misc_feature<222> (22)..(23)<223> Misc. Feature
   <400> 51
40 tntnccagag cctaatttgc cagtna
   <210> 52
   <211> 24
45 <212> DNA
   <213> synthetic
50 <220><221> misc_feature<222> (22)..(23)<223> misc. feature
   <400> 52
55 ttccagagcc taatttgcca gtna
   <210> 53
   <211> 24
60 <212> DNA

```



|    |  |    |
|----|--|----|
|    | <213> synthetic  |    |
|    | <220><221> misc_feature<222> (22)..(23)<223> misc. feature |    |
| 5  | <400> 53   |    |
|    | ttccagagcc taatttgcca gtna                                 | 24 |
| 10 | <210> 54   |    |
|    | <211> 25   |    |
|    | <212> DNA  |    |
| 15 | <213> synthetic  |    |
|    | <400> 54   |    |
| 20 | cttaccaacg ctaacgagcg tcttg                                | 25 |
|    | <210> 55   |    |
| 25 | <211> 14   |    |
|    | <212> DNA  |    |
|    | <213> synthetic  |    |
| 30 | <400> 55   |    |
|    | gctcccgag acac   | 14 |
| 35 | <210> 56   |    |
|    | <211> 15   |    |
| 40 | <212> DNA  |    |
|    | <213> synthetic  |    |
|    | <220><221> misc_feature<222> (1)..(2)<223> misc. feature   |    |
| 45 | <400> 56   |    |
|    | tntacgccac cagct   | 15 |
| 50 | <210> 57   |    |
|    | <211> 12   |    |
| 55 | <212> DNA  |    |
|    | <213> synthetic  |    |
|    | <400> 57   |    |
| 60 | cgctgtctcg ct  | 12 |

|    |       |  |    |
|----|-------|--|----|
|    | <210> | 58   |    |
|    | <211> | 19   |    |
| 5  | <212> | DNA  |    |
|    | <213> | synthetic  |    |
|    | <400> | 58   |    |
| 10 |       | gctcaaggca ctcttgccc   | 19 |
|    | <210> | 59   |    |
| 15 | <211> | 63   |    |
|    | <212> | DNA  |    |
| 20 | <213> | synthetic  |    |
|    | <400> | 59   |    |
|    |       | atgactgaat ataaacttgt ggtagttgga gctgggtggcg taggcaagag tgccttgacg | 60 |
| 25 |       | ata  | 63 |
|    | <210> | 60   |    |
| 30 | <211> | 45   |    |
|    | <212> | DNA  |    |
| 35 | <213> | synthetic  |    |
|    | <400> | 60   |    |
| 40 |       | tttttttttta attaggctct ggaaagacgc tcgtgaaacg agcgt                 | 45 |
|    | <210> | 61   |    |
| 45 | <211> | 14   |    |
|    | <212> | DNA  |    |
|    | <213> | synthetic  |    |
| 50 | <400> | 61   |    |
|    |       | cttcggagtt tggg  | 14 |
| 55 | <210> | 62   |    |
|    | <211> | 16   |    |
|    | <212> | DNA  |    |
| 60 | <213> | synthetic  |    |

```

    <220><221>  misc_feature<222>  (1)..(2)<223>  misc. feature
    <400>  62
5      ancttcggag tttggg                                     16

    <210>  63
10     <211>  16
    <212>  DNA
    <213>  synthetic
15     <220><221>  misc_feature<222>  (1)..(2)<223>  misc. feature
    <400>  63
20     cncttcggag tttggg                                     16

    <210>  64
    <211>  16
25     <212>  DNA
    <213>  synthetic
30     <220><221>  misc_feature<222>  (1)..(2)<223>  misc. feature
    <400>  64
35     gncttcggag tttggg                                     16

    <210>  65
    <211>  16
40     <212>  DNA
    <213>  synthetic
45     <220><221>  misc_feature<222>  (1)..(2)<223>  misc. feature
    <400>  65
50     tncttcggag tttggg                                     16

    <210>  66
    <211>  25
55     <212>  DNA
    <213>  synthetic
60     <400>  66
      gggttgtgga gtgagtgttc aagta                                     25

```

5 <210> 67  
 <211> 27  
 <212> DNA  
 <213> synthetic  
 10 <400> 67  
 ccatacctaatacgaactcactatagggc 27  
 15 <210> 68  
 <211> 21  
 <212> DNA  
 20 <213> synthetic  
 <400> 68  
 25 ctcatacagttacttgtcttc 21  
 <210> 69  
 30 <211> 489  
 <212> RNA  
 <213> Homo sapiens  
 35 <400> 69  
 gaacucacua uagggcucga gcgccgccc gggcaggucc gccacaaaaa ugcagauuuu 60  
 40 cgugaaaacc cuuacgggga agaccaucac ccucgagguu gaaccucgg auacgauaga 120  
 aaauguaaag gccaaagaucc aggaauagga aggaauuccu ccugaucagc agagacugau 180  
 cuuugcuggc aagcagcugg aagauggacg uacuuugucu gacuacaaua uucaaaagga 240  
 45 gucuacucuu caucuugugu ugagacuucg ugguggugcu aagaaaagga agaagaaguc 300  
 uuacaccacu cccaagaaga auaagcaca gagaaagaag guuaagcugg cuguccugaa 360  
 50 auauuauaag guggaugaga auggcaaaau uagucgccuu cgucgagagu gcccuucuga 420  
 ugaauuggu gcuggggugu uuauggcaag ucacuuugac agacauuuu guggcaaaug 480  
 uugucugac 489  
 55 <210> 70  
 <211> 52  
 60 <212> DNA

<213> synthetic  
 <400> 70  
 5 ggaatacgac tcactatagg gaaagtctct gccgcccttc tgtgcctgct gc 52  
 <210> 71  
 10 <211> 52  
 <212> DNA  
 <213> synthetic  
 15 <400> 71  
 ggaatacgac tcactatagg gaaagtctct gccgcccttc tgtgcctgct gc 52  
 20 <210> 72  
 <211> 647  
 25 <212> RNA  
 <213> synthetic  
 <400> 72  
 30 gggaaagucu cugccgcccu ucugugccug cugcucauag cagccaccuu cauuccccaa 60  
 gggcucgcuc agccagaugc aaucaaugcc ccagucaccu gcuguuauaa cuucaccaau 120  
 35 aggaagaucu cagugcagag gcucgcgagc uauagaagaa ucaccagcag caaguguccc 180  
 aaagaagcug ugaucuucaa gaccuuugug gccaaggaga ucugugcuga ccccaagcag 240  
 aaguggguuc aggauuccau ggaccaccug gacaagcaaa cccaaacucc gaagacuuga 300  
 40 acacucacuc cacaacccaa gaaucugcag cuaacuauu uuccccuagc uuuccccaga 360  
 caccuguuu uauuuuauua uaaugaaauu uguuuguuga ugugaaacau uaugccuuaa 420  
 45 guaauguuaa uucuuauua aguuauugau guuuuaaguu uaucuuucau gguacuagug 480  
 uuuuuuagau acagagacuu ggggaaauug cuuuuccucu ugaaccacag uucuaccccu 540  
 gggauuuuu gagggucuuu gcaagaauca uuaauacaaa gaauuuuuuu uaacauucca 600  
 50 augcauugcu aaaauuuau uguggaaaug aaauuuuugu aacuaau 647  
 <210> 73  
 55 <211> 16  
 <212> DNA  
 60 <213> synthetic  
 <400> 73

|    |  |    |
|----|--|----|
|    | ttcttcggag tttggg  | 16 |
| 5  | <210> 74<br><211> 26<br><212> DNA                                    |    |
| 10 | <213> synthetic<br><400> 74  |    |
| 15 | ccgtcacgcc tccttcggag tttggg   | 26 |
| 20 | <210> 75<br><211> 24<br><212> DNA<br><213> synthetic<br><400> 75     |    |
| 25 | aacccaaact ccgaaggagg cgtg   | 24 |
| 30 | <210> 76<br><211> 29<br><212> DNA<br><213> synthetic<br><400> 76     |    |
| 35 |  |    |
| 40 | gcgcagtgag aatgaggagg cgtgacggt                                      | 29 |
| 45 | <210> 77<br><211> 17<br><212> DNA<br><213> synthetic                 |    |
| 50 | <220><221> misc_feature<222> (1)..(2)<223> misc. feature<br><400> 77 |    |
| 55 | cnctcattct cagtgcg   | 17 |
| 60 | <210> 78<br><211> 30<br><212> DNA                                    |    |

|    |  |    |
|----|--|----|
|    | <213> synthetic  |    |
|    | <400> 78   |    |
| 5  | aacgaggcgc acctttacat tttctatcgt                         | 30 |
|    | <210> 79   |    |
| 10 | <211> 24   |    |
|    | <212> DNA  |    |
| 15 | <213> synthetic  |    |
|    | <400> 79   |    |
|    | ccttccttat cctggatcct ggca                               | 24 |
| 20 | <210> 80   |    |
|    | <211> 24   |    |
| 25 | <212> DNA  |    |
|    | <213> synthetic  |    |
|    | <400> 80   |    |
| 30 | acgatagaaa atgtaaaggt gcgc                               | 24 |
|    | <210> 81   |    |
| 35 | <211> 29   |    |
|    | <212> DNA  |    |
| 40 | <213> synthetic  |    |
|    | <400> 81   |    |
|    | cggaagaagc aagtgggtgcg cctcggttaa                        | 29 |
| 45 | <210> 82   |    |
|    | <211> 16   |    |
| 50 | <212> DNA  |    |
|    | <213> synthetic  |    |
| 55 | <220><221> misc_feature<222> (1)..(2)<223> misc. feature |    |
|    | <400> 82   |    |
|    | gncacttgct tcctcc  | 16 |
| 60 | <210> 83   |    |

|    |   |           |    |
|----|---|-----------|----|
|    | <211>   | 14        |    |
|    | <212>   | DNA       |    |
| 5  | <213>   | synthetic |    |
|    | <400>   | 83        |    |
| 10 | gctcccgcag acac                                       |           | 14 |
|    | <210>   | 84        |    |
| 15 | <211>   | 30        |    |
|    | <212>   | DNA       |    |
|    | <213>   | synthetic |    |
| 20 | <400>   | 84        |    |
|    | caaagaaaag ctgcgtgatg atgaaatcgc                      |           | 30 |
| 25 | <210>   | 85        |    |
|    | <211>   | 50        |    |
|    | <212>   | DNA       |    |
| 30 | <213>   | synthetic |    |
|    | <400>   | 85        |    |
| 35 | gaaggtgtct gcgggagccg atttcacat cacgcagctt ttctttgagg |           | 50 |